

# MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 8

NOVEMBER, 1935

Number 6

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A  
Magazine  
for  
Mechanical  
Executives:  
Construction  
Production  
Maintenance

Member



More Than  
25,000  
Circulation  
Each  
Issue

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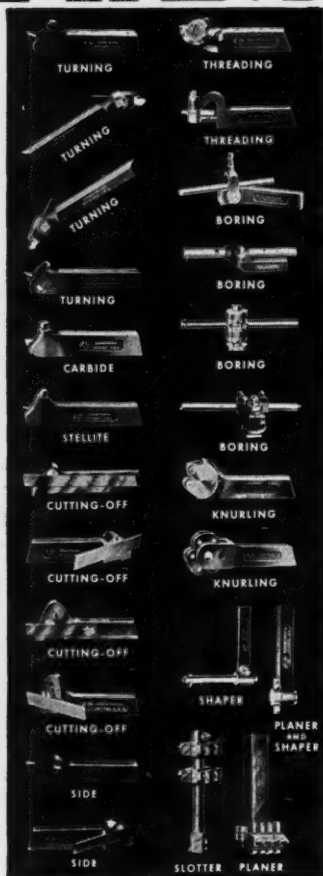
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The Armstrong System of Tool Holders provides permanent multi-purpose tools for every operation on lathes, planers, slotters and shapers.



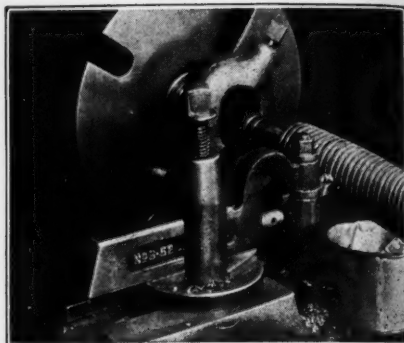
## ARMSTRONG

Tool Holders, Turret Lathe and Screw Machine Tools, "C" Clamps, Lathe and Milling Machine Dogs, Ratchet Drills, Setting-Up Tool, High Speed Steel, Carbide Cutters, Machine Shop Specialties.

## ARMSTRONG BROS.

Dies and Stocks, Receding Type Threaders, Pipe Cutters and Cutter Wheels, Pipe Vises, Pipe Wrenches and Chain Tongs.

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**You can't save on ARMSTRONG TOOL HOLDERS . . . you save with them.**

When it comes to cutting costs, you can't save on ARMSTRONG TOOL HOLDERS. To try to do without the right one for each job, to "get-by" with makeshift or hand-forged tools, is certain to ADD to your costs.

With ARMSTRONG TOOL HOLDERS you are permanently tooled-up (time and tool cost saved); any mechanic can make or re-sharpen a cutter-bit in a few minutes ("dressing" delays eliminated, machine hours saved); each ounce of steel in a bit does the work of 10 ounces on a bar (steel consumption cut to 1/10); bits can be used down to the last inch (no waste in heavy tool "stumps"); and since each ARMSTRONG TOOL HOLDER is a multi-purpose tool that does the work of a complete set of forged tools, heavy investment in costly tools and high costs of storing and handling are ended.

If you are seriously interested in cutting cutting-costs to the absolute minimum, buy more ARMSTRONG TOOL HOLDERS . . . adopt the Armstrong System and "Save All Forging, 70% Grinding and 90% High Speed Steel" on every operation on every lathe, planer, slotter and shaper.



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Used in Over 96% of the Machine Shops and Tool Rooms

# MODERN Machine Shop

CINCINNATI, OHIO

VOL. 8, No. 6

NOVEMBER, 1935

## The Training of Apprentices at the Brown & Sharpe Plant

*The possibility of a shortage of skilled labor is focusing the attention of manufacturing executives upon the matter of apprentice training. Here is a resume of the training methods in use in one of America's best-known plants.*

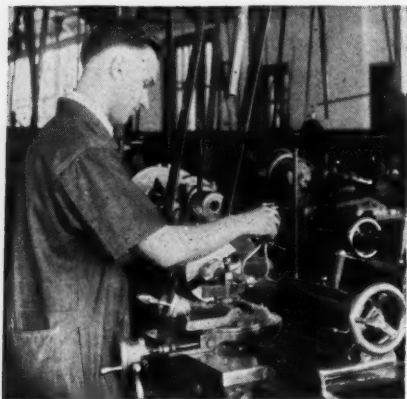
BY FRANCIS A. WESTBROOK

THE name "Brown & Sharpe" has for many years been synonymous with accuracy and fine workmanship. Founded more than 100 years ago, the activities of the Brown & Sharpe Manufacturing Company have consistently been directed toward the development of tools, machines, and mechanical units with which the manufacturers of America could work to increasingly closer limits of accuracy and produce increasingly finer products.

Eighty-five years ago David Brown invented and built the first linear dividing head in America, which enabled him to produce steel rules of unusual excellence and thus laid the foundation for the line of machinists' tools with which everyone connected

with the metal working industries have long been familiar. Two years later Mr. Brown designed and built a precision gear cutting machine, following with the original universal milling machine and still later with a universal grinding machine. During the past half century the metal working industries of the world have come to Brown & Sharpe for thousands of these machines and tools, principally because of these two considerations—accuracy and fine workmanship.

Granting the necessity of design and supervision, in the last analysis these fine tools have been produced by expert artisans—workmen trained to appreciate close accuracy and fine workmanship and the methods by which these objectives are achieved.



The lathe is the first machine to which the apprentice machinist is assigned.

Such workmen are not always available, however, and when industry is operating at normal capacity, there is usually a shortage. Under such conditions, there are but two methods by which skilled workmen can be obtained; they can be made, or they can be hired away from other industries by offers of higher wages. The latter method is not only unfair; it fosters an unhealthy condition and is unsatisfactory for many reasons. Skilled mechanics cannot be trained in a day, however, nor are all men capable of such training.

In view of this fact, the Brown & Sharpe Manufacturing Company many years ago inaugurated a course of systematic training for machinist apprentices, involving a high degree of care in the selection of the candidates and a thoroughness of instruction comparable to the accuracy and finish of the fine tools made by this firm.

To become an expert mechanic requires a fair amount of education and a high degree of native ability, and young men who are to become the recipients of training for such work should be selected with care. The discrimination displayed by the

Brown & Sharpe Company in the selection of their apprentices and the thoroughness of the training methods used are evidenced by the large number of Brown & Sharpe-trained men who have become managing executives in other metal-manufacturing plants. Included among these are the presidents of two of America's outstanding machine tool manufacturing firms, the president of at least one smaller machine tool firm, and a great number of engineers and executives in other industries.

The boys selected for training at this plant must be not less than sixteen nor more than eighteen years of age if grammar school graduates, or nineteen if high school graduates. They are drawn from all over the United States, and occasionally from foreign countries. One was recently entered from India. No boy is ever given special consideration as a result of politics, even when suggested by important men.



A Brown & Sharpe apprentice learning the fine points of pattern-making.



All apprentice activities are controlled from a central department under the direction of an apprentice supervisor whose task it is to not



An apprentice draftsman at work.

only supervise the training of each boy, but also to keep a check on his personal habits, recreation activities, and so on.

Applicants accepted for apprenticeship are taken on trial for three months. This trial period serves two purposes; it gives the applicant an opportunity to discover whether or not he is going to be happy at the work he has chosen, and it gives the

company a chance to find out whether or not the boy measures up to requirements.

Monthly reports are made on each boy by the foreman of the department in which the boy is working, and also by the shop and class instructors. All reports go

direct to the apprentice supervisor. Records are also kept of his attendance, and in this way a fairly accurate determination can be made of the adaptability of the applicant.

If, at the end of the three months' trial, the company finds the beginner satisfactory and the boy wishes to proceed with his apprenticeship, he signs an agreement, together with his parent or guardian and an officer of the Brown & Sharpe Company, to faithfully carry out the terms of the apprenticeship for the remainder of the four-year period. When the agreement is signed, an entrance fee of \$50 is paid to the company, this fee being forfeited if the apprentice fails to fulfill his part of the agreement. At the end of a satisfactory apprenticeship, the graduate receives a diploma and a cash bonus of \$150.

During the trial period a set of tools is loaned to the beginner. If at the end of his period of probation he is accepted for regular apprenticeship, this set is replaced by one which the boy will keep permanently, and which costs about \$13. This set, together with whatever other tools are purchased by the apprentice during his period of training, are marked



Instructing a class of apprentices in problems of gear design.

by the company, without charge, with the name of the apprentice.

Each apprentice serves a certain amount of time at each type of machine tool, starting with simple turning operations on the lathe, and is transferred from one type of machine to another according to an established

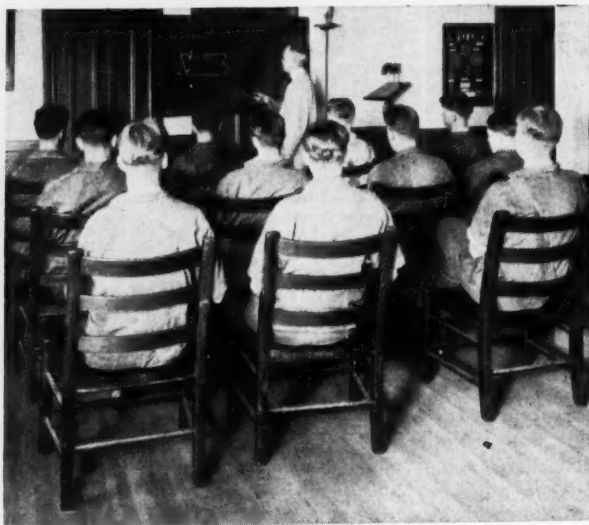
week receiving class instruction.

Class work in the machinist course includes blueprint reading, decimals, fractions, ratio and proportion, linear and angular measure, volume and weights, geometry, trigonometry, threads, logarithms, gearing, mechanical drawing, mechanics, physics as supplied to mechanisms, cutting speeds and feeds, composition of metals, object and general methods of heat treatment, and so on.

At regular intervals lectures are given by practical men, on shop time, on such subjects as cutting oils, grinding wheels, gear design, the use of precision instruments in the taking of fine measurements, safety methods, machine design, shop hygiene, job analysis, foremanship, and other kindred topics which have the ob-

ject of making the boy well-informed and broadening his viewpoint regarding the details of plant management.

The apprentice is paid at a regular hourly rate for all the time he puts in in the shop, classroom work included, and this rate is increased at regular periods during his term of apprenticeship. Although enough is allowed the student to live comfortably the rate is necessarily low during the primary months of his training period but his earnings may be augmented by either of two methods. If he regularly receives marks of excellence from foremen, shop instructors, and the class instructor, he is

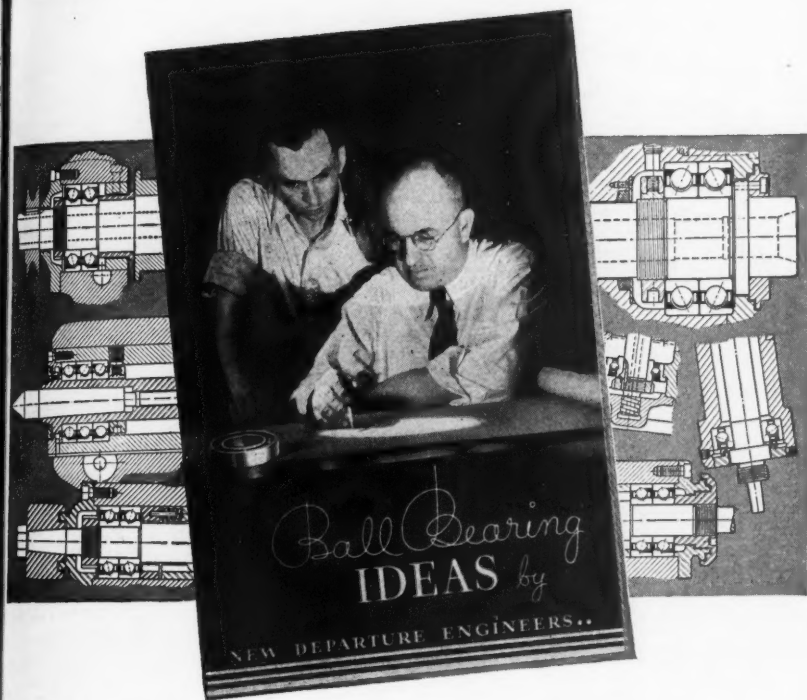


Apprentices listening to a lecture on correct tool grinding.

schedule. For instance, he is required to spend 24 weeks at the lathe. The boy who cannot learn what he is expected to in the time allotted is dispensed with; the one who learns exceptionally fast usually becomes the most expert workman. During the third and fourth years the boy is schooled in tool-making and machine repair work.

During the first and second years the apprentice spends two hours each week in class and about five hours in study outside of his shop and class work. This is gradually increased until by the fourth year he is spending approximately four hours per

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## This Booklet Yours for the Asking

*Ideas* are always welcome — particularly when they improve design both from a cost and a performance standpoint.

New Departure has always been as noted for its *ideas* as for the quality of its ball bearings.

The applications in this book are representative of the manner

in which ideas conceived and developed by New Departure engineers are carried forward to the practical use of machine builders.

If you are interested in ball bearing ideas, ask for Booklet IX.

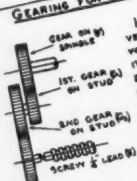
The New Departure Mfg. Co., Bristol, Connecticut. Branches at Detroit, Chicago, San Francisco.

*New Departure also makes the Variable Speed Transitorq*

# NEW DEPARTURE

## BALL BEARINGS

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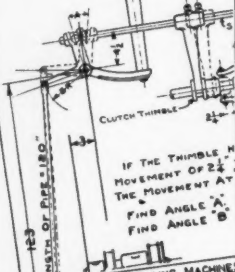
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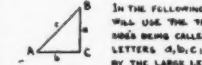
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## TRIGONOMETRY



IN THE FOLLOWING PROBLEMS USE THE TRIGONOMETRIC FUNCTIONS CALLED BY LETTERS A, B, C AND BY THE LARGE LETTER

(1) GIVEN: ANGLE B = 47°15', SIDE C = 8. FIND: ANGLE A AND SIDE AB.

(2) GIVEN: ANGLE A = 41°9', SIDE B = 15. FIND: ANGLE B AND SIDE AC.

(3) GIVEN: SIDE C = 2008' AND SIDE B. FIND: ANGLE A AND SIDE AB.

(4) GIVEN: SIDE B = 963.3' AND SIDE C. FIND: ANGLE A AND SIDE AB.

(5) GIVEN: SIDE C = 6236' AND SIDE B. FIND: ANGLE A AND SIDE AB.

(6) THE LEGS OF A RIGHT TRIANGLE RESPECTIVELY. FIND THE ANGLE SHORTER LEG.

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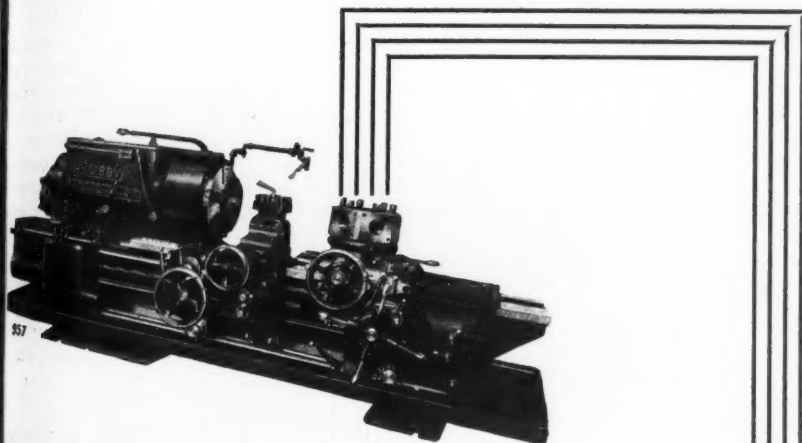
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**Libby**  
**UNI-FLEX**

*with New Power Feed*

## CROSS SLIDING TURRET

1. Adapted to large quantity production—rigid for heavy duty work.
2. Easily, simply, inexpensively changed to turn out small quantities—or even one piece.
3. A large variety of operations can be accurately, easily, and economically performed.
4. Will bore, turn, face, form, drill, recess, thread, ream, undercut, tap, etc., either straight or taper simultaneously.

**THE LIBBY UNI-FLEX** is exceptionally universal and flexible—it offers possibilities for real money savings. With its advanced operating features, users are enabled to employ simple and inexpensive standard tools on the turret and machine practically any bar or chucking piece without material change in tool set-up.

The power feed cross sliding-turret with tri-way double gib provides the rigidity and accuracy comparable to a stationary turret. With the spindle mounted on taper roller bearings, faster speeds with close accuracy are possible. Machine cuts are limited only by what the most modern cutting tools will stand.

Libby Uni-Flex turret lathes are built in five sizes. It will pay you to thoroughly investigate these machines.

*Write for illustrated catalog.*

**THE INTERNATIONAL MACHINE TOOL CO.**  
**INDIANAPOLIS, INDIANA**

given an "excellent" rating, and is accordingly given a higher rate per hour.

The other means of increasing earnings is by piecework. As fast as the apprentice learns the various details of machine operation he is given jobs from the regular run of production work, and wherever practical he is given a special piecework price, both as a part of his training in modern production shop work and to develop in him a spirit of industry which probably could not be developed as quickly by any other means.

The piecework jobs assigned to the apprentice are comparatively short, however, and no apprentice is permitted to work on the same job longer than is necessary for him to acquire a thorough knowledge of the work involved. Piecework is not provided in all departments in which the apprentices work, but in those departments where it is given, the average apprentice can increase his earnings by a substantial amount over the regular hourly rates.

Such training as has been described in this article lays a foundation upon which the young man who is fortunate enough to receive it can build according to his capabilities and ambitions. Some of the Brown & Sharpe graduates prefer toolmaking, others like machine repair work. Those who have the stuff of which leaders are made eventually become foremen, master mechanics, superintendents, and executives in other capacities.

Frequently the design and operation of a particular type of machine appeals to the graduate apprentice and he takes a postgraduate course with the idea of becoming a demonstrator. This special training often leads to selection for sales work, beyond which lies the goal of a district managership or a sales executive position in the home office.

The difference between adequate

training and the lack of it is often the difference between a mediocre existence and a successful, happy one. Such training as the apprenticeship course described here not only enables a number of worth-while young men to find themselves and become useful members of society, credited both to themselves and to their employer, but it also assures the employer of an adequate supply of competent workmen, especially trained in his methods and capable of translating his ideas and the ideas of his designers into products of the highest quality.

### Handbook and Catalog of Prosser Widia Fine Cemented Carbides

Thomas Prosser & Son introduced to the American market, in 1927, the first piece ever seen of the original cemented carbide composition, which was known as "Widia." Since that time the remarkable hardness, cutting ability, and wear resisting properties of the cemented carbides have become well known.

Those of the industry who have not as yet become fully acquainted with the possibilities offered by these carbides, who are not sure that they are taking the fullest advantage of the opportunities for increased production and decreased costs, will find all their questions answered in a "Handbook and Catalog of Prosser Widia Fine Cemented Carbides" which is being issued by the above firm.

The book gives a brief general history of the cemented carbides, tells how Widia is made, outlines the characteristics, and tells how it is tested for hardness. More than 60 illustrations are used, among which are a number of photographs showing interesting jobs in action.

Other chapters deal with the Practical application of Metal cutting Theory, General Recommendations for Use of Widia, Proper Tool Design, Recommended Grinding Procedure, and Instructions for Making Your Own Widia Tools. The book closes with pictures and illustrations of Typical Prosser Widia Tools and an Outline of the Complete Prosser Engineering Service. A copy of the book will be sent to any mechanical engineer or executive who will address his request on his letterhead. Address Thomas Prosser & Son, 15 Gold St., New York, N. Y.



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# SUNOL

## EMULSIFYING CUTTING OIL

**Cincinnati 5-48 Plain  
Hydromatic Milling  
Machine**

**Lubricant: 1 part Sunoco  
Emulsifying Cutting Oil  
to 20 parts Water.**

**Cincinnati No. 2  
Centerless Grinder—**  
**Lubricant: 1 part Sunoco  
Emulsifying Cutting Oil  
to 40 parts Water.**



**Sun Oil Co., Ltd., Montreal**  
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*Subsidiary Companies:*

**SUN OIL COMPANY, PHILADELPHIA**

# A New Era In Industrial Lighting

*The "science of seeing" has provided a new foundation upon which to base lighting specifications*

BY DEAN M. WARREN

General Electric Company, Nela Park Engineering Department

**V**ARIOUS FORCES—including the NRA and various labor organizations—have been striving to the end that the industrial worker should

self. After the day's work you may relax and rest by playing, reading a book, playing bridge, going to the theatre—but for your eyes such re-

creation is just the beginning of another day's work.

During the research conducted in the course of developing the Science of Seeing, Dr. M. Luckiesh discovered that it requires actual energy to see. In fact, one-fourth of all the energy we consume in the course of living is spent in seeing. This is not hard to believe when you stop to think that at school, at work, at play, we are using our eyes during all of our waking hours.

Since seeing is such a vitally important part of living, it would seem to follow that the work of the eyes should be made as easy as possible. Yet much of the time, deplorably enough, we are mak-

ing their seeing tasks as hard as possible for them by forcing them to work in the wrong lighting environment, which in time results in damaging the eyesight,



Here is an example of the modern system of "General Lighting Plus." The special supplementary unit provides 125 footcandles of illumination to facilitate the performance of an operation involving skill and clear visibility.

work not more than 40 hours per week. But, these forces notwithstanding, the average adult eye continues to do sixteen hours of work, more or less, a day. Figure it out for your-

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It is estimated that eye-strain over a period of time causes more defective eyesight than all the other causes combined, and eye-strain results largely from using eyes under improper lighting conditions. A good system of artificial light offers better visibility, is constant in quality, and unvarying in its effect on the eye and will pay for itself through decreasing production costs.

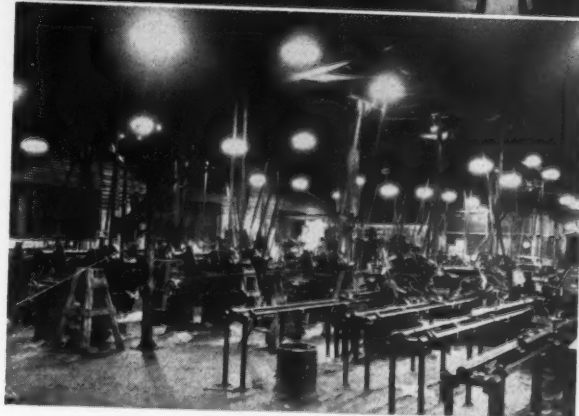
This statement is not surmise. Good lighting materially increased the rate of working in an interesting laboratory experiment conducted some months ago. The level of illumination, for test purposes, was raised from 3 to 12 footcandles, and the results show that the efficiency of some individuals was increased as much as 40 per cent.

Classification of Workers	Increase in Rate of Working
With better eyes	14%
With poor eyes	22%
Fast Workers	28%
Slow Workers	40%

From these figures it is obvious that good lighting is an equalizer in human performance. Note that it helps most those who need help most.

Good lighting not only implies light in sufficient quantities, but light of the quality to make seeing as nearly effortless as possible. Many factors determine the comfortable quality of

light, such as the types of reflecting and diffusing equipment used, the location of lighting units, the nature and light-absorption or reflection qualities of the surroundings and such.



Here are photographs of a machine shop, taken as it appeared before and after the lighting system was revamped. Light should be considered as a tool, and no shop, however well-equipped, can really be modern with an out-of-date lighting system.

### The Evils of Glare

It is not comfortable to look at the sun when it is high in the heavens. Neither is it comfortable to look at a sheet of water glistening in the bright sunshine. In looking directly

at the sun you encounter direct glare. In looking at the sheet of water under the bright sunlight, you encounter reflected glare. Both are uncomfortable, and you instinctively turn your eyes away from them.

But the industrial worker cannot

Seeing, through its establishment of a definite relationship between light and vision, gives a new foundation upon which to base lighting specifications, and ushers in a new era in lighting—an era of what is known as General Lighting Plus.



Adequate illumination is necessary in the toolroom. The extra cost of good lighting over poor lighting will be saved in higher production, lower percentage of spoiled work, and better workmanship.

look away from his work. To perform his task he must look at it, even though the bare bulb dangling at his bench is uncomfortably bright and is annoyingly reflected into his eyes by the polished metal he may be working on.

So the illuminating engineer of today recognizes that supplying light of the right quality for comfortable eye work is as important as supplying light of the right quantity.

In the past, the engineer knew little about how the eyes used light, or how much light they required. There was little available data on the subject. Today, however, the Science of

where the severity of the visual task dictates plenty of "seeing light." Under all conditions, excepting very rare cases, a ratio of ten to one is well within the safe limits. For example, if the general lighting system supplied 10 footcandles, the localized spot could be illuminated to at least 100 footcandles without any suggestion of eye discomfort.

Comfortable seeing conditions are also influenced by the interior finish of the room in which the lighting is installed. Often the amount of illumination in a room may be increased from 15 to 20 per cent merely by cleaning or repainting the walls and

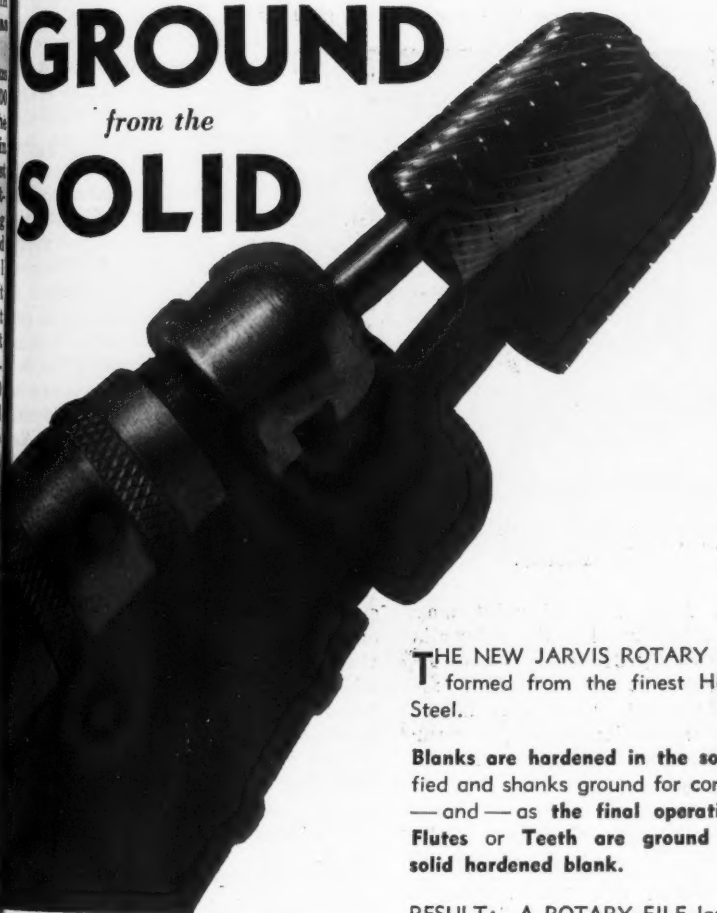
Science tells us that 100 to 500 footcandles is the desirable goal in lighting for best seeing. It is doubtful if such lighting could be obtained from a general system, nor is it necessary that it should be. We must have general lighting; the 100 to 500 footcandles desired is in addition to the general and can most economically be obtained by locating "high intensity" units near the ceiling and so directing them as to build up the illumination at those points

# JARVIS ROTARY FILES

## GROUND

## SOLID

*from the*



**T**HE NEW JARVIS ROTARY FILES are formed from the finest High Speed Steel.

Blanks are hardened in the solid, rectified and shanks ground for concentricity — and — as the final operation — the Flutes or Teeth are ground into the solid hardened blank.

**RESULT:** A ROTARY FILE lasting several times as long and cutting faster than any rotary file not made this way.

*Write for catalog showing a multitude of sizes and shapes.*

**The CHARLES L. JARVIS Company**  
GILDERSLEEVE, CONN.

doing the same to the ceiling.

The sidewalls of a factory area may absorb 70 per cent of the light striking them, and reflect the other 30 per cent down into the room to be used by the eyes of those who work



Special supplementary lights supplying 125 footcandles of light at the work-benches relieve eye-strain and insure accuracy.

there. A fresh coat of paint may turn the tables so that the sidewalls will absorb only 30 per cent and reflect 70 per cent of the light it receives. Frequent paintings insure good lighting efficiency and the maintenance of a good seeing environment.

Delving still deeper into the effi-

**Francke Flexible Couplings Catalog No. 50.** This catalog, issued by John Waldron Corporation, Dept. M., New Brunswick, New Jersey, describes in detail the construction and application of the Francke Flexible Coupling. This coupling, which is so constructed as to be torsionally resilient, permits free endwise movement of connected shafts and so designed as to compensate for the shaft misalignment. The booklet contains pictures of applications and a table showing the sizes and h.p. of couplings for a wide variety of applications. Copy free upon request.

ciency of a lighting system, the importance of wiring is proved. The current flowing through the wiring system supplies the energy that makes the wheels of the lighting system go round. Nor will these wheels turn efficiently if there is too great a discrepancy between the voltage available at the socket and the voltage marked on the lamp.

A differentiation of 1 per cent in voltage lessens the light output about 3.4 per cent. A difference of 5 volts will result in a difference of about 14 per cent. The wasted light is of a purer quality too, because as the voltage is reduced and the filament temperature dropped, the light produced becomes yellowish.

Seeing is such a big part of living that the eyes that do the job for us deserve every consideration. They deserve enough light of a comfortable quality to make their work as easy for them as possible. Nor is good "seeing" light expensive. Adequate lighting can be provided at a cost approximating one to two per cent of the average manufacturing costs.

**Cincinnati All-Steel Shears Catalog S.** The line of All-Steel Shears made by The Cincinnati Shaper Co., Cincinnati, Ohio, is presented in this 24-page book. Not only are the various features of the presses described in this booklet, but pictures of the various sizes and types of the machines are also shown, together with a view of the interior of the plant in which they are made. The book will be found very useful to users of heavy duty shears and press brakes. Copy free to mechanical executives upon request.



# DRIVER High or Low Speed DRILL PRESS

- 6-splined spindle.
- 4 SKF Precision Ball Bearings.
- Jacobs (0 to 1/2") Key Chuck.

Driver Drill Presses have unique qualities which quickly make them indispensable in any industrial plant. To minimize vibration the pulley is suspended between two SKF bearings (there are two more in the quill). The six-spline spindle promotes better balance. These and many other features justify your making a *point-by-point comparison* with any drill press of like capacity.

Write for Bulletin DP6, it gives complete information.

## Features

Maximum distance chuck to table 12".

Maximum distance chuck to base 17 1/2".

Center of chuck to column 7 1/2".

Table size 10" x 9" adjustable to tilt any angle. Base 10" x 9".

Diameter steel column 2 3/4".

Spindle travel 4".

Steel quill 1 13/16" diameter with teeth to match feed pinion milled into it.

Standard and slow speed pulleys are interchangeable and available separately.

Standard pulley 600-1250-2440-5000 R.P.M.

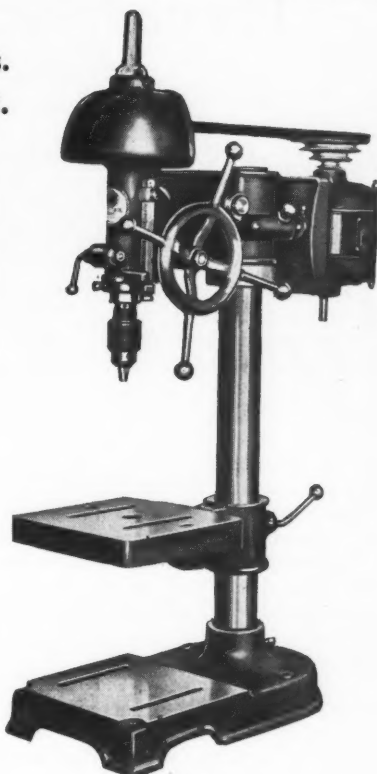
Slow speed pulley 480-940-1300-2900 R.P.M.

Above speeds obtained by using 1750 R.P.M. Driver motor.

Lower speeds may be obtained by using 1150 R.P.M. Driver motor.

Height over all 39 1/2".

Shipping weight 125 lbs.



D925

Price \$35.00

Bench Model with standard pulley and motor belt, less motor.

Slow speed pulley with 2 SKF Ball Bearings available, extra.....\$2.95

# WALKER-TURNER CO., Inc.

Winfield

New Jersey

# Methods Engineering Procedure: Job Analysis

By H. B. MAYNARD

President, Methods Engineering Council, Inc.

*In This, the Second Article of This Series, the Author Tells How  
a Task is Analyzed So That Unnecessary Motions  
May Be Eliminated.*

**I**F sufficient data are first collected, accurate time values can be established upon practically any kind of work where human effort is necessary to accomplish a definite end. The methods engineer deals with fundamentals; the eighteen basic divisions of accomplishment, for example, or the five classes of motions which the human body can make, or the laws of motion economy, or the principles of leveling. These fundamentals have all been established as the result of considerable experimentation and scientific research, and they are universally applicable.

It is the purpose of the next three articles to discuss the technique which the modern methods engineer uses in establishing time values. The subjects of job analysis, motion study, and time study will be described in as much detail as space permits, but it must be realized that the description can only be an outline of the subject. With the developments and progress which have been made recently, methods engineering has developed into a science, and those who would follow it as a profession find it necessary to devote an amount of time to its study and mastery comparable to the time required for the study of

other specialized branches of engineering.

From the viewpoint of the methods engineer, all work is made up of what are known as basic divisions of accomplishment. There are only eighteen basic divisions, but work from the simplest to the most complex is done by using them to varying sequence and with varying repetitions. The characteristics of each basic division are known to the methods engineer and by applying his knowledge of motion times and the laws of motion economy to them, he is able to arrange for their performance in a highly efficient manner. Since he views all work in the light of basic operations, it makes no difference to him whether he is studying the making of toys, tools, trains, or tractors. The same principles apply to all.

This can be illustrated as follows. Assume that an operation consists of moving a pencil from right to left a distance of one foot. This can be done by picking up the pencil and moving the arm with the elbow as a pivot or by moving the arm with the shoulder as a pivot. From his knowledge of motion times, the methods engineer knows that the pencil can be moved about 24 per cent faster if the pivot

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Ross Straightway  
Normally Open  
Type Valve

## NEW ROSS STRAIGHTWAY SOLENOID CONTROLLED VALVES

Since the introduction of Ross Solenoid Controlled Three and Four Way Operating Valves, the demand for a similarly constructed straight Open and Shut valve has increased to such an extent that it is now being manufactured as a standard product. Features include:

1. Applicable to all operations, where straightway solenoid valves are used, but designed primarily for industrial use where service is more severe.
2. Furnished in two styles—normally closed or normally open.
3. Each unit includes metal dust cover. All connections to valve and solenoid are through the base. Piping is installed permanently to base and either valve or solenoid can be removed without disturbing remainder of unit.
4. Furnished for either A. C. or D. C. in all standard voltages for pipe sizes ranging from  $\frac{3}{8}$ " to  $1\frac{1}{4}$ ".

*Write for prices.*

**ROSS OPERATING VALVE CO.**

6488 EPWORTH BLVD.  
DETROIT MICHIGAN

is about the elbow. Therefore, during his study he will position the pencil at the work place so that it can be moved with a forearm movement which pivots about the elbow.

Once the best method of moving a pencil a distance of one foot has been worked out, it should be evident that the same method can be applied to the moving of a fountain pen, or in the machine shop, to the moving of a small tool or part. Stated in this way, the sameness of these operations is readily apparent, and yet there is not a methods engineer who has not heard time and again the statement: "That's all right for the Blank Company because they have a standard product (or a non-standard product, or a light product, or a heavy product), but our work is different."

To be sure work is different in so far as size, material, accuracy requirements, quantities, and so on, go, but these variations merely cause variations in the number, length, and sequence of the basic operations required to do the job. They do not cause any change in the fundamental nature of the basic operations.

Certain considerations, notably quantity, will cause the methods engineer to vary his approach to a given job to some extent, but he has a technique which can be applied in any case which may arise, and he can bring about improvements on any type of work where inefficiencies exist. Hence, most of what follows applies equally to steam engines manufactured in quantities of one, or screw machine products turned out by the million.

#### The Initial Approach to Operation Study

The first step in beginning to study any operation consists of finding out everything about it which is known. Therefore a thorough analysis should first be made. It is probably more

important to do this carefully if one is familiar with a job than if he is not. If one is not familiar with a job, he will analyze it carefully anyway, but if he is familiar with it, he may through oversight, neglect something of fundamental importance. The reason that a methods engineer is able to go into a plant and eliminate a number of operations altogether is not because he is brighter than the men working regularly in the plant, but because these men have seen the operations performed so often that they accept them unquestioningly as being necessary.

In a certain department of a large manufacturing plant, one of the operations consisted of bending a copper segment on a Bulldozer to an approximate radius and then shaping it to the exact radius, using a metal template. The part was then sent to another department where six round bars were brazed to it. In order to perform the brazing operation, the operator would take a mallet and straighten the segment, thereby totally destroying the radius just formed so expensively.

This, of course, seems incredible, and it may be thought that such a thing could not happen in a well managed plant. The reasons behind the job, however, are clear, and no one was particularly to blame. The segments were used to form a circle, so the engineering department computed the proper radius and put it on the drawing. The department which formed the radius in the segments followed the drawing and made the radius exact.

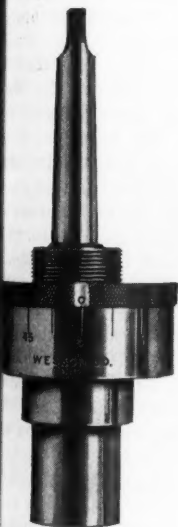
The brazer in the other department found by experiment that he could make better time if he would straighten the segments, braze on the bars, and then bend them again roughly. He therefore changed his method without saying anything to



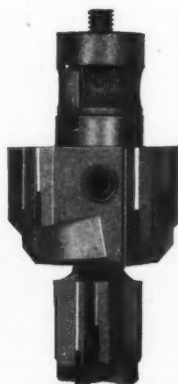
There is a BETTER way with a BETTER tool to BETTER  
Your Production

# USE WESSON CUTTING TOOLS

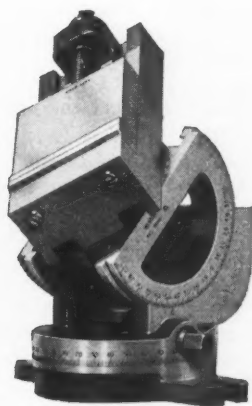
Interchangeable Counter Bores, Multi-Cluster Diameter  
Tools, Spotfacers, Countersinks, Micro Adjustable Boring  
Bars, Cemented Carbide Tipped Tools and Gauges,  
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STOP COLLAR  
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MULTI-CLUSTER  
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Life long guarantee with every tool.  
Write for catalog and send blue prints  
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DETROIT, MICHIGAN

anybody. The segments were small and the diameter of the circle which they formed was large so that variations from the true radius were unimportant and unnoticeable in the final assembly. Each department did its own work properly, and it required a thorough analysis of the job to uncover the condition described.

### The Analysis Sheet

A few experiences of the kind described will convince one of the need of a preliminary careful analysis before the detailed study is begun. There are a number of points which should be considered when making an analysis and in order that none may be overlooked and in order that the results of the analysis may be permanently recorded, the use of a form similar to that shown by Figure 1 is desirable. The form carries the methods engineer step by step through the complete analysis and insures the considering of every factor which is likely to affect the operation.

The Analysis Sheet, Figure 1, has been filled out to show the manner in which information is recorded. Note that whenever an opportunity for improvement is uncovered, a record is made of the action taken. This is important, for in order for the analysis to be of maximum value, all of the suggestions for improvement must be acted upon.

In analyzing any operation, the first point to consider is the purpose of the operation. Often it will be found that an operation, or part of an operation, is not necessary at all. For example, a certain part is being machined. The purpose is to make a surface with a good appearance. The surface, however, is subsequently painted. The paint is fairly heavy and if applied directly to the rough casting will form a smooth coat. Thus it is apparent that the machining

operation is unnecessary.

If the operation is necessary, the operations performed before and after the one being analyzed should be considered. For example, an operation consists of filing burrs which are left by a milling operation. The operation is necessary, for the burrs would present a poor appearance and might cause those handling the part. Investigation of the milling operation shows that the operator stands idle while the machine is cutting. The obvious arrangement is to have him file the burrs himself during this idle time. Thus the filing operation is eliminated as a separate operation.

Inspection requirements often have an important influence on the job being studied. If they are too rigid, unnecessary work will be performed. If too loose, the parts will not function properly and subsequent operations will be necessary.

Therefore inspection requirements must be examined closely, for they may affect to a large extent the method followed. For example, if the requirements for a certain two-inch diameter shaft manufactured in quantities are that the diameter must be held to plus 0.000 minus 0.001 in. with a high polish, the job must be roughed on an automatic or a semi-automatic lathe and finished on a grinder. If the requirements for the same shaft are plus or minus .010 in. with the marks permitted, the whole job may be done on the automatic and the grinding operation may thus be entirely eliminated.

The material of which any part made is specified by the design engineers and theoretically should not be a concern of the methods engineer. Design engineers, however, like other human beings are not infallible and sometimes they specify an unnecessarily costly material. It is proper and necessary that the

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# YOU "Pay the Piper" when TAPS are SKIMPED



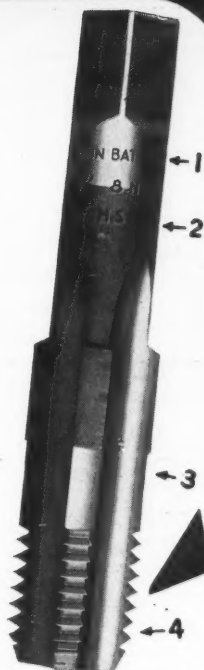
HERE

IT TAKES 2350 degrees to properly heat treat high speed steel. Since the teeth of a tap do the real work in thread cutting, it is of vital importance that they be properly tempered so as to give maximum service.

To expose tap teeth to this high heat means overheated, poorly hardened threads. The BATH process entirely avoids this because by this process the teeth are formed not before hardening but AFTER hardening. The entire thread is formed by grinding into ideally hardened metal.

Note the photograph which indicates the four major steps of the BATH process.

1. Shows the amount of material removed in grinding the shank.
2. Shows the unfinished hardened surface as it comes from the heat treatment.
3. Grinding on the major diameter. See how sufficient material has been removed from the tap blank so that no hardening decarburization remains on the tops of the teeth.
4. Threads which are GROUND FROM THE SOLID—AFTER HARDENING.



Briefly, the BATH process provides a grain structure in the teeth just as perfectly heat treated as the core of the tap; complete freedom from "soft" teeth and unsurpassed accuracy. In addition highly polished surfaces, both on the flutes and on the threads, contribute amazingly to their long life. It's not the cost per tap, but the cost per thousand holes tapped, that tallies up the piper's tribute.

## JOHN BATH & COMPANY, INC.

WORCESTER, MASS.

Date <u>Feb. 16, 1935</u>		Dept. <u>Small Machining</u>		Dwg. <u>822 304</u>		Sub. <u>2</u>	
Mould <u>Die</u>		Style <u>Item 4</u>					
Pattern <u>8191-A</u>		Ins. Spec. <u>L. Spec.</u>		Sub. <u>2</u>			
Part Description <u>Clamp for Type XA Regulator Shaft</u>							
Operation <u>Mill Slot</u>				Operator <u>Jones</u>			

DETERMINE AND DESCRIBE				DETAILS OF ANALYSIS			
1. PURPOSE OF OPERATION <u>To mill slot in casting. Slot fits Regulator Shaft</u>				Can purpose be accomplished better otherwise?			
Dwg. <u>122 301</u>							
2. COMPLETE LIST OF ALL OPERATIONS PERFORMED ON PART							
No.	Description	Work Sta.	Dept.				
1.	<u>Make Casting</u>		<u>Foundry</u>	Can opn. being analyzed be eliminated? be combined with another? be performed during the period of another? Is sequence of opns. as possible? Should opn. be done in other dept. to save cost of handling? Are tolerance, allowances, finish and other requirements necessary? too costly? suitable to purpose? Consider size, suitability, straightness, and condition. Can cheaper material be substituted? Should crane, gravity conveyors, totepans, or special trucks be used? Consider layout with respect to distance moved. How are dwgs. and tools cured? Can set-up be improved? Trial pieces. Machine Adjustments. <div style="text-align: center;">Tools</div> Suitable? Provided? Ratchet Tools Power Tools Spl. Purpose Tools Jigs, Vises Special Clamps Fixtures Multiple Duplicates			
2.	<u>Mill Slot</u>	<u>Small Milling Machines</u>	<u>Small Machining</u>				
3.	<u>Drill 2 Holes</u>	<u>Sensitive Drill Press</u>	<u>Small Machining</u>				
4.							
5.							
6.							
7.							
8.							
9.							
10.							
3. INSPECTION REQUIREMENTS							
a—Of previous opn. Casting must be filled out completely and have no porous spots, rough spots, or burned in sand.							
b—Of this opn. $\pm .002$ " This tolerance unnecessarily close for purpose. Checked with Schauer advisability of changing to $\pm .005$ ". Will advise 2/17/35. <u>OK Changed 2/17</u>							
c—Of next opn. Holes must be properly located and to dwg. dimensions.							
4. MATERIAL <u>Common Brass. OK. Brass must be used. Alloy specified is cheap and easily machined.</u>							
Cutting compounds and other supply materials <u>None</u>							
5. MATERIAL HANDLING							
a—Brought by <u>Conveyor</u>							
b—Removed by <u>Conveyor</u>							
c—Handled at work station by <u>Operator by hand.</u>							
6. SET-UP (Accompany description with sketches if necessary)							
<u>Standard vise is bolted to machine table with 2 bolts. Totepan placed on floor to left of machine. Empty totepan to receive machined parts placed on floor to right of machine</u>							
a—Tool Equipment							
Present <u>Standard vise 6" spl. side cutter T-807</u>							
Suggestions <u>Use vise with quick acting clamp. <u>Adopted 2/20</u></u>							
<u>Provide ejector for removing part from vise. <u>Adopted 2/20</u></u>							

Fig. 1.—Reproduction of an actual Analysis Sheet. Size, 8½x11 inches.

ods engineer should check into cases of this kind and bring them to the attention of the designers.

In other cases, certain material present shop difficulties which may not be known to the designer. A

# 7. CONSIDER THE FOLLOWING POSSIBILITIES.

1. Install gravity delivery chutes. *Original 2/10*
2. Use drop delivery. *Recommended to Riley 2/16*
3. Compare methods if more than one operator is working on same job. *Advised 2/10*
4. Provide correct chair for operator. *Recommended to Frank 2/11*
5. Improve jigs or fixtures by providing ejectors, quick-acting clamps, etc. *Original 2/10*
6. Use foot operated mechanisms. *Recommended to Riley 2/16*
7. Arrange for two handed operation.
8. Arrange tools and parts within normal working area.
9. Change layout to eliminate back tracking and to permit coupling of machines.
10. Utilize all improvements developed for other jobs.

## 8. WORKING CONDITIONS

Satisfactory

- Other Conditions Quantities have recently increased to 50000 per order thus justifying suggested more elaborate set-up.

## 9. METHOD OF PROCEDURE (Accompany with sketches or Process Charts if necessary)

### a-Before Analysis and Motion Study

- Pick up small part from table
- Place in vise
- Tighten vise
- Start machine
- Run table forward 4"
- Engage feed
- Mill slot
- Stop machine
- Return table 6"
- Release vise
- Lay part aside in totepan
- Brush vise

### b-After Analysis and Motion Study

#### Machine #1

- Pick up small part from table
- Place in vise
- Tighten vise
- Start machine
- Run table forward 4"
- Engage feed
- Turn to machine #2

Mill slot

- Turn from machine #1
- Return table 6"
- Stop machine
- Open vise (part ejected aside)
- Brush vise

#### Machine #2

Mill Slot

- Turn from machine #1
- Return table 6"
- Stop machine
- Open vise (part ejected aside)
- Brush vise
- Pick up small part from table
- Place in vise
- Tighten vise
- Start machine
- Run table forward 4"
- Engage feed
- Turn to machine #1

Mill Slot

## RECOMMENDED ACTION

- Yes - From vise to totepan
- Not necessary
- Only one operator
- Must stand to operate 2 machines
- Yes - See Tool Suggestions
- Can operate air hose by foot if nec.
- Not practical
- Operator instructed
- Yes
- Done

- Light
- Heat
- Ventilation, Fumes
- Drinking Fountains
- Wash Rooms
- Safety Aspects
- Design of Part
- Clerical Work Required (to fill out time cards, etc.)
- Probability of Delays
- Probable Mfg. Quantities

## Arrangement of Work Area

### Placement of

- Tools.
- Materials.
- Supplies.

### Working Posture

- Does method follow Laws of Motion Economy?
- Are lowest classes of movements used?

Saving  
10000 x .55 = 250,000  
= \$1100.00 per year

See Supplementary Report  
Entitled  
Plan and Machine, Process  
Chart for Mill Slot Op'n

Date  
2/22/35

OBSERVER A. Kennedy

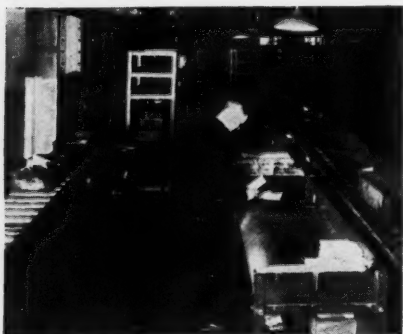
APPROVED BY S

## Reverse Side of Analysis Sheet

tain cheap brittle material may present great machining difficulties, and the amount of scrap may be so high

that it would be less expensive to specify a more costly but more easily machined material.

When the material called for is correct, as it is in the majority of cases, the condition of the material should be considered. That castings come to the machine shop with excess metal, hard spots, or in a warped condition is known to every shop man. The methods engineer should take it upon himself to correct such conditions.



The use of conveyors permits centralized dispatching and close production control on small quantities.

Material handling, Item 5 on the Analysis Sheet, is a study in itself. In general, the part which is the least handled is the best handled. Handling problems are as numerous and varied as the parts handled, but they present a fertile source of saving. The wide use of conveyor systems is an indication of this. Although it is commonly thought that conveyors can only be used to advantage on mass production work, there are types on the market which are equally successful on jobbing work. Not only do these latter conveyors eliminate material handling labor, but by using them in conjunction with a dispatching system, they permit far better production control. Figures 2 and 3 show an installation of this kind.

It is often felt that conveyors must be specially built and expensive to be

efficient. As a matter of fact, a chute knocked together from two or three wooden boards or made by bending a piece of sheet iron is, in many cases, as efficient as the most costly power conveyor.

If a careful study has not been made, many plants are laid out so that a great deal of unnecessary handling is required. Major changes of layout do not usually result from the analysis of a single operation, although they may. Usually a study conducted with the aid of Flow Process Charts is required to arrive at the best layout for all work handled.

The set-up, Item 6, is directly tied up with the method; that is, the set-up determines the method, and the method determines the set-up. When the proper set-up has been determined as the result of methods study, the making of the set-up itself should be studied for there are often possibilities for improvement, particularly when set-ups are numerous.

The tool equipment used on any operation is most important. Repetitive jobs are usually tooled up efficiently, but there are many opportunities for savings through the use of more efficient tools which are often overlooked on small quantity work.

For example, an operator doing miscellaneous work on which he frequently uses a screw-driver, because the work is miscellaneous, is usually provided with an ordinary screw-driver which is whatever happens to be available in the tool room at the time he draws out his tools. It has been worked out by laboratory experiment that there is a certain size of screw-driver handle which is easier for a man with a given size hand to use than any other. It need hardly be pointed out that this point is commonly unknown, or at least unconsidered, in industries performing mis-

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## LET SOUND THINKING GUIDE YOUR CHOICE

SOUND THINKING, SO WELL PORTRAYED HERE BY RODIN'S FAMOUS STATUE "THE THINKER," HAS ENABLED SUCCESSFUL INDUSTRIAL ENTERPRISES TO SOLVE THEIR MOST DIFFICULT PROBLEMS THROUGH EVERY PERIOD OF BUSINESS UNCERTAINTY. \* SOUND THINKING ON DRILLING AND REAMING PROBLEMS, WE BELIEVE, WILL BRING US TO THE CONCLUSION THAT THE 50-YEAR OLD PREFERENCE FOR "CLEVELAND" TWIST DRILLS AND REAMERS IS AN UNDISPUTABLE PROOF OF LOWER COST-PER-HOLE PERFORMANCE. \* "CLEVELAND" DRILLS AND REAMERS ARE ALWAYS MARKED WITH THIS SYMBOL  . IT IS THE MARK OF GOOD TOOLS THOUGHTFULLY MADE.

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cellaneous work. Furthermore, a ratchet screwdriver is just as universal as a solid screw-driver, and much quicker to use, but few of them are used on small quantity work.

There are a number of other quick-acting fairly universal tools on the market which can be used in many cases to replace the conventional standard tools. The first cost is usually higher, but the labor economies gained soon offset this.

There are certain possibilities for

times encountered. In most cases it is best to correct them. It is sometimes difficult to justify the cost of making improvements by the direct labor savings, but there are other factors which must be considered in this connection. The human element can not be neglected. Conditions which are unhealthy, uncomfortable, or hard and arduous breed dissatisfaction. Besides lowering production, they increase labor turnover, increase accidents, and often lead to labor unrest.

The analysis of the method followed in performing the operation is perhaps the most important part of a job study. The consideration of the method is seldom, if ever, complete at the time the analysis sheet is filled in, but goes on in one form or another during the remainder of the time that the job is studied. The method which is established after analysis and motion study, is recorded under 9B in order that

the analysis sheet may be fully filled out, although this information, strictly speaking, does not belong under the heading of analysis.

Usually the analysis of the method requires the drawing of one or more types of Process Charts, and often a number of computations are involved. This information should be gathered together in the form of a supplementary report, and reference to it should be made on the analysis sheet.

A detailed description of the procedure followed in analyzing operating methods will be given in the article which follows.



Conveyors for small quantity work reduce material handling and conserve floor space.

improvement which should be considered in analyzing every job. These are listed under the head of Item 7 on the Analysis Sheet. Most of them are self-explanatory, or will be understood after the subject of motion study has been discussed in the next article.

Working conditions have an important influence on production. This has been quite widely recognized during recent years, and the most modern plants usually provide working conditions which the methods engineer considers to be suitable. In the older plants, or in modern plants where methods studies have not been made, poor working conditions are some-

(Illustrations courtesy Westinghouse Electric & Manufacturing Company.)





*An Announcement  
about Van Dorn, Black  
and Decker, Marschke  
Grinders and Buffers,  
—of interest to ma-  
chine tool dealers as  
well as to all indus-  
tries.*

**VONNEGUT MOULDER CORPORATION** has acquired the exclusive rights, including patents and all facilities for manufacturing, servicing and selling the well-known **MARSCHKE HEAVY DUTY, ELECTRIC GRINDERS and BUFFERS** formerly manufactured for the Van Dorn, Black and Decker organization by the Marschke Manufacturing Company of Indianapolis.

**THE MARSCHKE SPECIFICATIONS** include AC and DC motors ranging from 1 to 25 H.P. with constant, multi and variable speed drives for **HEAVY DUTY FLOOR STANDS, BUFFERS, POLISHERS and SWING GRINDERS** to fit the many different requirements, of large and small plants, in almost every branch of industry.

**THE COMPLETE MARSCHKE LINE** is being manufactured here in the former plant of the Marschke Manufacturing Company. Some sizes of several types of machines are available for immediate delivery. Orders for other sizes will have prompt attention and your inquiries for information regarding this desirable line of machines will be appreciated.

**VONNEGUT MOULDER CORPORATION**  
1801 MADISON AVE. INDIANAPOLIS, IND.

## Stock Control that Ties Up With Sales

By JEROME F. McCLURG

**A** YEAR or two ago a twist drill manufacturing company in the East found themselves confronted with the problem of installing a stock-control system that would make it possible to better serve the many customers and at the same time reduce the amount invested in goods that did not move. The system that had been in use previously did not keep in touch with sales closely enough so that the manufacturing schedule could be controlled and coordinated with the current progress of sales. Under such conditions the firm found themselves over-stocked on some items and just as badly under-stocked on others.

After considerable study and experiment the plan described below was put into effect, and has worked out to the entire satisfaction of everyone concerned.

A schedule representing average sales for a period of months is drawn up, showing separately each size and style of tools regularly carried in stock. Half of the schedule is devoted to finished goods and is regarded as the absolute minimum to which the stock is allowed to fall.

Goods on hand will soon become exhausted unless backed up by goods in process, so the remaining portion of the schedule concerns goods in process of manufacture. The sum of completed goods in stock and incomplete goods in process in the shop approximates the firm's average sales for the period. When the total stock falls below this sum, another "order to make" is placed in the shop.

The actual clerical procedure is as follows:

A stock-record card of the usual

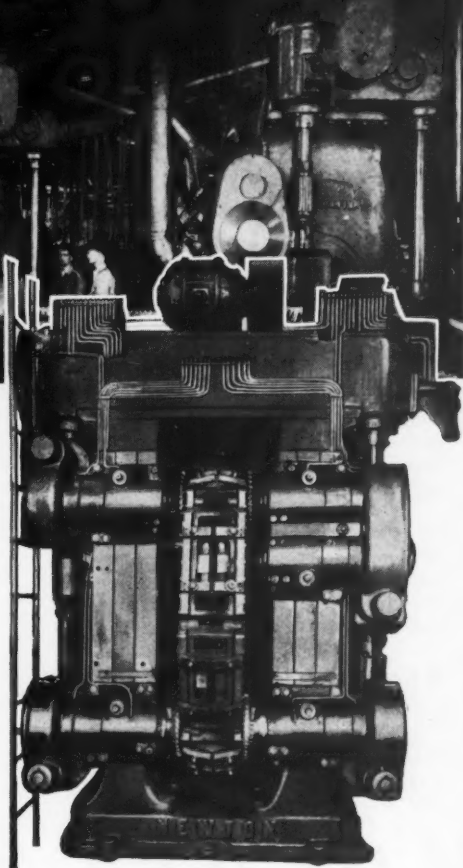
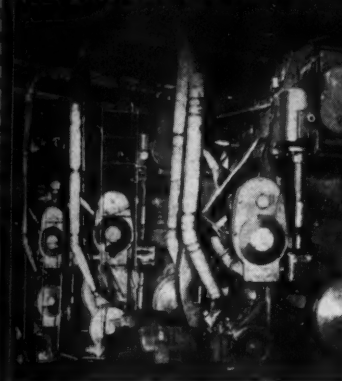
type is employed and entries are made daily as sales are made and orders filled from the shelves. Minimum quantities are set for both "stock on hand" and "stock on hand in process." If, upon balancing the card, the stock on hand is found to have fallen below the minimum set, a red tag is attached to the card. If the total of goods on hand plus goods in process falls below the minimum set, a blue tag is attached.

At least twice a week—and often if necessary—the files are examined for blue tags. For each card to which a blue tag is attached an order is made out for the shop and entered on the card, then the tag is removed. Once a week the files are examined for red tags, and a list of such items is sent to the manufacturing department heads concerned. This list keeps these officials informed as to goods that are moving fast and upon which the stocks are low, and thus gives them an opportunity to give their items preference on manufacturing schedules. The red tag is not removed from the card, but remains attached until the material indicated has been placed in finished stores.

Under the plan outlined, the shelves contain at all times approximately the quantities planned for, and from these quantities withdrawals are made daily as required for sales. These withdrawals are at the same time being replenished by finished products from the shop, while still further back the goods in process are being replenished in like amounts by raw stock.

The use of this system has made it possible to reduce inventories considerably since production is now con-

Now **PLYMOUTH** *specifies*  
**PULSOLATOR AUTOMATIC LUBRICATION**  
 ON  
**ALL NEWTON MILLERS**

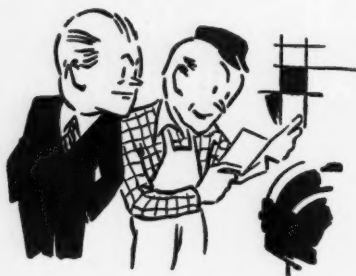


Plymouth Motor Corporation, valuing production above all else, saw that automatic lubrication could safeguard their machines against costly shut-downs. They installed PULSOLATOR on one machine—others followed—now they specify PULSOLATOR AUTOMATIC LUBRICATION on new equipment.

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## DIAMOND TOOLS

concentrated on the items that sell fastest. Manufacturing time has been shortened for the same reason. Manufacturing costs have been reduced because the better-selling items can now be made up in larger quantities and the general investment has been lessened because over-stock on slow sellers has been reduced to the minimum and products for which there is little or no demand have been eliminated from the production schedules.

**Booklet Describes 55 Carboly Applications at Cleveland Show.** Production executives interested in an up-to-the-minute report on the increase in speed, accuracy and economy possible with new machines equipped with cemented carbide tools will find much food for thought in a new 20-page booklet just published by Carboly Company, Inc., Detroit—manufacturers of Carboly cemented carbide tools.

The booklet describes and illustrates the 55 applications at the Machine Tool Show on which Carboly cemented carbide tools were used to demonstrate new machines. The 55 applications—demonstrated by 33 prominent machine tool builders—cover a representative cross section of machines, operations and materials. Data covers practically every type of metal working machine in common use; the materials cut include cast iron, steel, brass, bronze and aluminum alloys; all of the common machine operations are represented.

In each case, speeds, feeds, depth of cut, floor-to-floor time, etc., is tabulated. This information should prove of value to the metal working executive inasmuch as the majority of the applications demonstrated were production jobs rather than stunt performances impossible to duplicate in the average plant.

Copies of the booklet may be obtained by writing Carboly Company, Inc., 287 East Jefferson, Detroit, Michigan. Ask for Booklet No. A-17.

**Erie Drop Hammers and Trimming Presses.** This 12-page folder describes the features of design of the drop hammers and trimming presses made by Erie Foundry Company, Erie, Pa. Tables of standard dimensions are included also material specifications for the different types of hammers and presses. Copy free upon request.

If you spare a moment to fill out this coupon, you may *save hundreds of dollars on rod stock.*  
Others have . . .

## For BRASS Does Cut Costs on many screw machine products



69% more parts for the same dollar of cost, by changing from steel stock to Brass! How one manufacturer effected that substantial saving is told in complete detail in our new 20-page booklet which contains other comparative cost figures.

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Company.....

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## ANACONDA COPPER & BRASS

## Ideas from Readers

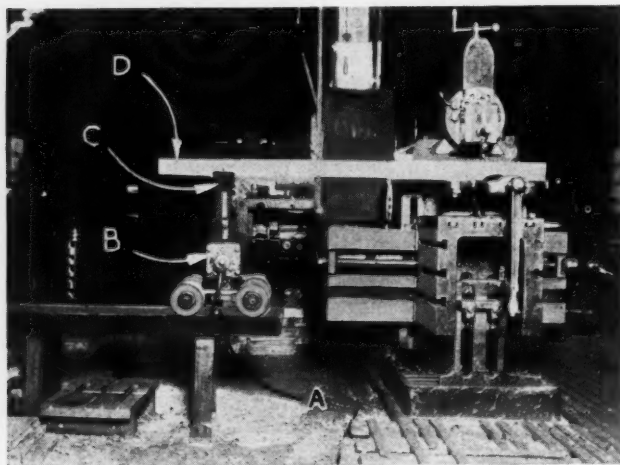
This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

### Outboard Support For Use In Machining Heavy Parts

By H. H. HENSON

THE accompanying illustration shows a safe and efficient support for holding the free ends of heavy parts while shaping. The usu-

With the device illustrated, all that is required is to place the end of the work that is to be machined in the shaper vise and the opposite end on the supporting head of the device. Any misalignment can be corrected by turning the crank A to the right to raise or to the left to lower the head until the correct alignment is obtained.



Support for use when machining heavy parts in the shaper.

The device consists essentially of a carriage mounted on an elevated track made out of a piece of 12-in. wide channel iron, the length of the track depending upon the length of the work that is processed in this machine. The work is indicated at D.

The carriage is of simple construction, consisting of only four wheels, two axles,

al device for supporting heavy parts on a level with the shaper table consists of a roller mounted on a trestle, or a hoist that requires a considerable amount of time to adjust level with the table of the machine. Then, if the trestle is not set up level, it may be found that the part being machined has raised or lowered out of alignment with the machine-table.

one steel plate base, one supporting head or fork C, and a 15- or 25-ton Norton or Duff jack. Instead of the ratchet handle which is usually a part of the jack, however, a steel crank handle A has been substituted so as to provide quick action in raising or lowering the head. The jack is anchored to the base plate with cap screws forming a complete unit.





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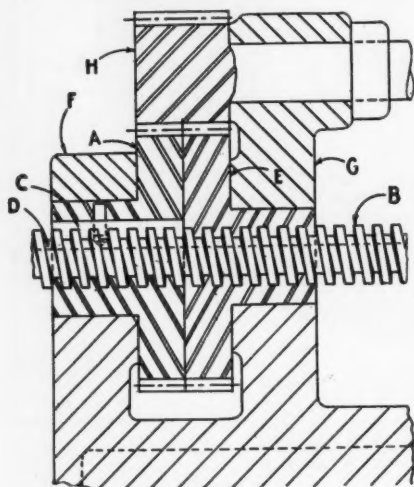
**ABRASIVE COMPANY**  
Philadelphia, Pa.

DIVISION OF SIMONDS SAW AND STEEL CO.

## Simple Differential Gearing For Obtaining A Fine Feed

By J. E. FENNO

**A**N extremely fine feed is imparted to the wheel slide of a surface grinding machine by means of the differential motion between the revolving feed screw and the nut. This arrangement is shown in the ac-



Drawing showing how fine feed of a feed screw is obtained through simple differential gearing.

companying illustration and has a gear A, the bore of which is slightly greater than the outside diameter of the screw B. One end of the screw is connected to but free to rotate in the wheel slide and is allowed to slide axially in the bore. However, it is presented from turning in gear A by a key C engaging the spline D in the screw.

Gear E has one tooth less than gear A and is tapped out to serve as a nut for the screw. Both gears A and E are provided with hubs supported in

the stationary bearings F and G which are cast integral with the machine frame. These gears are rotated in the same direction but at different velocities by the pinion, which rotates at a constant speed.

Gear A has 41 teeth and gear E, 40 teeth. Consequently, when gear A has revolved one revolution, gear E has rotated  $1 \frac{1}{40}$  revolution or  $1/40$  revolution relative to gear A. Therefore gear A and the screw must rotate 40 times in order to rotate the gear E (nut) one revolution relative to the screw.

In other words, for every 40 revolutions of gear A, the screw is fed along axially a distance equal to the lead of the screw. The economy of this method of obtaining a high gear ratio is obvious, in that with the ordinary gear train a relatively large number of gears would be required. In addition to this a larger space would be necessary to accommodate a regular gear train.

It will be noted that both of the gears A and E have the same diameter. However, the same pitch cutter is used for both. The teeth in gear E are cut slightly deeper so that the tooth thickness will be the same as gear A. This does not affect the operation of the gears as the involute form of tooth is used and a slight variation in the tooth depth is permissible for most practical purposes.

## Parallels For Use With Magnetic Chuck

By C. F. FITZ

**P**ARALLELS for use with magnetic chucks are usually built up of alternate blocks of steel and a non-magnetic metal, the entire assembly being held together by non-magnetic rivets. The parallel shown in the drawing is unique in that it was built

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THERE IS WRIST  
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**PORTER**

## SWIVEL HEAD CUTTER

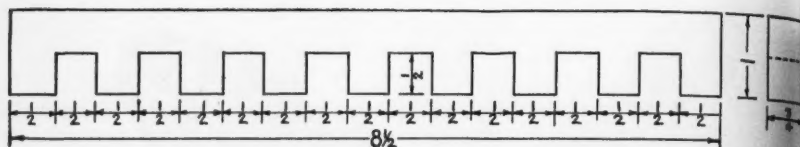
The Swivel Head principle—of time-tested Porter design and construction—permits the head to swing in any degree, from in line with the handles, to a full right angle position on either side. It actually "bends to the job"—over, under and around obstructions. Full cutting power is maintained in every position. The most versatile cutter ever developed. Saves time and labor on all difficult jobs. Frees the operator from strain and awkward bending. Order from your supplier or write us for descriptive circular.

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**EST. 50 YEARS**





Design of all-steel parallel for use with magnetic chuck.

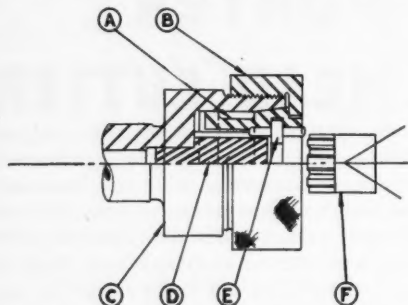
entirely of steel, and made to the sizes shown in the drawing. This parallel was used in connection with the surface grinding of some cast iron parts which were flat on one side, the opposite side having lugs that projected at regular intervals.

The flat side of the work-piece was to be surface ground; thus the piece was located on the flat upper surface of the parallels (two of which were used), while the feet of the parallels rested on the magnetic bars of the chuck.

### Pitch Line Pin Chuck

By E. R. SNYDER

THE drawing herewith shows the design of a chuck that was made to hold the gear end of a small part, indicated at F in the drawing, while the bore in the opposite end was be-



Design of Pin Chuck for Holding a Gear at the Pitch-Line

ing ground. It was required that the bore be ground both concentric and parallel with the teeth. Having

a number of these parts to grind, a special fixture was economical.

The chuck consists of the body C, into which is press-fitted the plug D to act as a stop for the work F. The pins E are made with a shoulder in the middle, one end of the pin resting in a longitudinal groove in the plug D and the other end serving to grip the gear at the pitch line. Three pins were used in this chuck, although the number is optional.

To close the pins down on the pitch line of the gear teeth, the nut B is screwed onto the body C, this action forcing the sleeve A into the body C. As the sleeve A is made similar to a spring collet; that is, split part way longitudinally, it closes as it is forced into the body C, due to the taper on the outside of the sleeve which slides in a corresponding taper on the inside of the body. Thus the pins bear equally on the teeth of the gear and hold the piece in perfect concentricity.

### Coolant For Machining Stainless Steel

By W. L. WOODSON

WE MACHINE a great deal of stainless steel at the Newport News Shipbuilding and Dry Dock Company, and inasmuch as a number of inquiries have been received relative to the cutting compound used on this material, the formula is presented here for the benefit of those who have use for it.

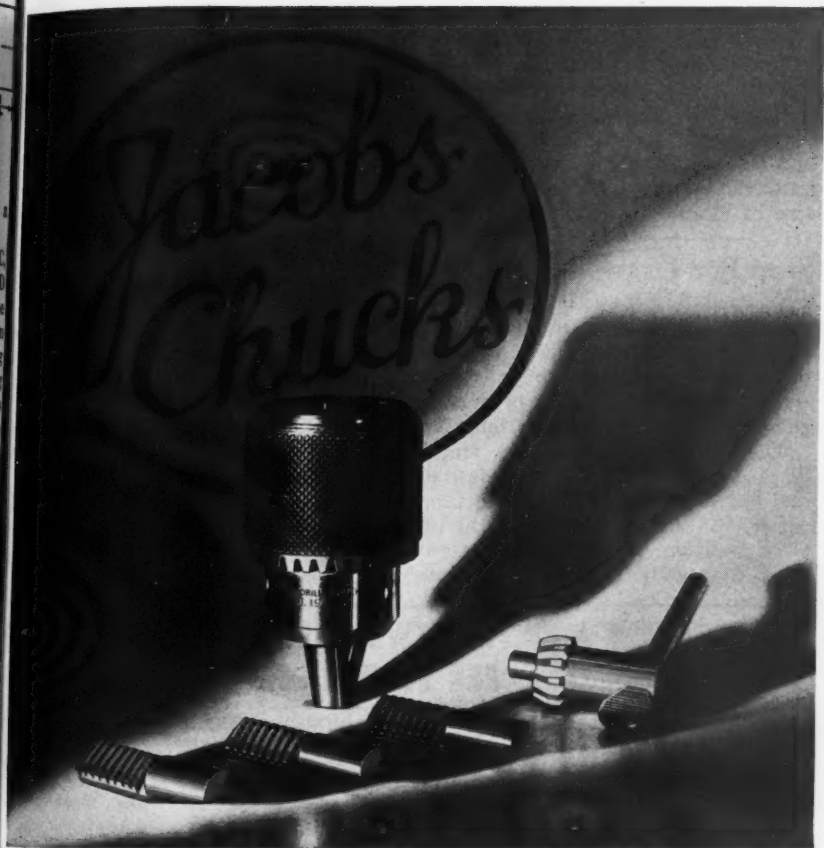
The compound consists simply of 1/3 carbon tetrachloride and 2/3 high

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## ATTENTION TO *Details*

It's the little things that count—in a chuck as well as in anything else. And it is the Jacobs policy to constantly improve its product wherever possible, with just as much attention paid to the small detail as to the large. This New Jacobs Plain Bearing Chuck looks about the same as the older models, but detail for detail there's a world of difference. The

jaws, for example, are of a new alloy steel, practically unbreakable. Even the threads are new type—stronger "grippier" and faster working. The key, too, is improved; handier, better leverage, and rust-proof.

Just a few of a host of details, large and small, that add up to make the Jacobs name synonymous with the finest in Chucks.

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sulphur cutting oil. This compound is used in power hacksaws, turret lathes, milling machines, and so on, and gives very good results in machining stainless steel turbine blades, valve seats, stems, bodies, and similar parts. We make gate valves up to the 16-in. size of stainless steel.

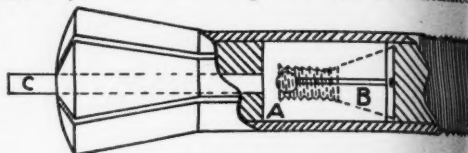
## Stop For Draw Collet

BY F. B. HELANDER

**T**HE device shown in the drawing is a very useful piece of equipment where a number of pieces of work are to be produced in a collet chuck and cut to the same length.

The split bushing A is a sliding fit in the collet, and is bored taper and threaded inside to fit the taper screw B. When located in the desired position, the screw B is tightened, expanding the bushing and an-

choring it in the location selected. When the work-piece C is placed in the chuck, it is shoved back against the stop before the chuck is tightened and thus all pieces will be machined



Collet with stop and work-piece in position.

to the same dimensions or cut at the same distance from the end.

## G-E Equipment for Machine Tools

This four-page folder, issued by General Electric Company, Schenectady, New York, describes and illustrates the different types of electrical motors, magnetic switches, push-button stations, reversing drum switches, and other equipment which is designed especially for application to machine tools. Copy free upon request.



## TAP TWO THOUSAND 9-36 THREADS PER HOUR IN STEEL WITH ATLAS

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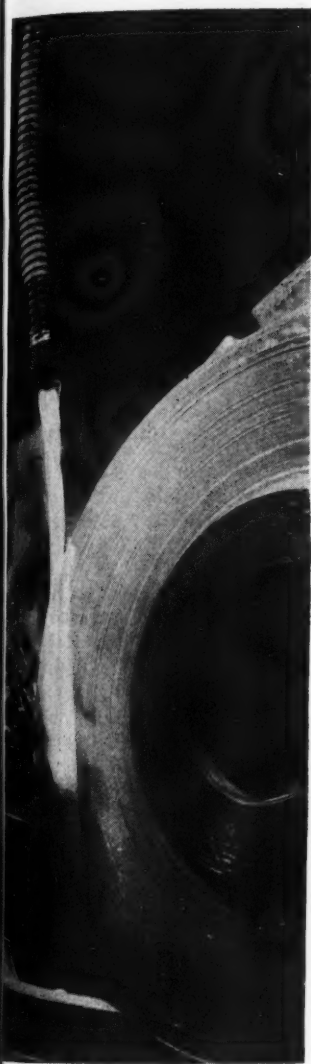
Machine production increased 30%; cutting speed increased 20%; pieces per grind increased 500%; oil cost decreased as much as 50%.

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## Over the Editor's Desk

### *The Top Sergeant of Industry*

**I**N AN address to the Machine Tool Congress at Cleveland in September, W. S. Knudson, Vice President of the General Motors Corporation, expressed an appreciation of the foreman and his job which we think should be passed on for the benefit of those of our readers who were not present at that meeting.

Among other things, Mr. Knudson said "The foreman is an essential part of our scheme of management and it is important that we so recognize him and that he also be made to realize that he is definitely a part of management . . . As far as General Motors is concerned, . . . we are looking to the foreman for the running of the employees.

"We must look to the foreman for the executive ability to see that labor takes the material and equipment which capital has provided and produces a product or service of the necessary quality. We must also look to the foreman for management ability to see that labor takes the facilities which capital has provided and produces the proper requirements in the matter of quantity. We must, therefore, look to the foreman to supply a large portion of the executive ability necessary to produce the product or service within, of course, cost limits established by the selling price of the product.

"Today, when the need for harmonious labor relationships is great for the good of the nation, we must look to the foreman to establish and maintain this harmony, to represent the company and its policies to the workers. . . . We must look to the foreman for the elimination of the individual grievances which so often fester into serious affairs.

"We in General Motors are pleased with the reduction in accidents which foremen have accomplished for us this year. Nobody can bring about the elimination of these unfortunate and avoidable accidents as quickly and as thoroughly as foremen. Both we and our employees look to our foremen for suggestions to improve safety, to reduce accidents, and to provide suitable working conditions.

"This brings up the matter of instruction and training of employees. Here again we must look to the foreman. Without properly-trained employees he cannot get the quality and quantity for which he is responsible; he cannot get the elimination of accidents for which he must be held responsible; he cannot hold within reasonable limits the cost of tools, upkeep of equipment, and manufacturing defects. It is the foreman who must foster and develop the mechanical skill and pride in quality on the part of his men.

"We must sooner or later look for the next crop of superintendents, production managers, plant managers, and general managers when the present crop is harvested. What more fitting and natural place to look than to our foremen? If foremen are made to realize their responsibilities and opportunities, it is hoped that many of them will train themselves to become better executives so that when we want them for general charge, we will have a sufficient supply from which to draw."

Mr. Knudson was talking for his own firm and referring to his own foremen, but what he said applies just as aptly to every other firm and every other foreman. A foremanship is an opportunity which should not be neglected.

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#### AVIATION PLANT SUPERINTENDENT

"It answers the speed question with speed plus power. It is a wonder for aviation work."

#### AUTOMOTIVE TOOL ROOM FOREMAN

"It solves all of our close corner drilling problems."

#### MAINTENANCE ENGINEER

"It's so small and light that our men carry it in their kits on every job."

#### REFRIGERATION PURCHASING AGENT

"Our repair bills have been cut in half, yet they have actually increased production."



## INDUSTRY HAS OKEYED THE *smallest* ELECTRIC DRILL EVER BUILT

● Weighing only 2-½ pounds and with the same POWER as tools TWICE its size, the NEW THOR U-14 ¼" Drill is receiving greater acceptance in industry than ever before received by any portable electric drill.

Because it is so small and easy to handle, it is increasing operating efficiency, speeding up production and is an exceptionally fine tool for plant maintenance. Its unusual size provides greater accuracy than larger, heavier tools. Users are experiencing lower maintenance costs, typical of all THOR tools, because none of the fine features of THOR "Motor Design" have been sacrificed in its construction.

Small . . . compact . . . completely equipped with heavy duty ball-bearings . . . highest quality materials used throughout assure long life in maintenance work or under the strain of continuous production. If you have not seen the NEW U-14, write for information and a demonstration. See for yourself why men in industry everywhere are acclaiming it as the finest electric tool they have ever operated.

#### CONTRACTOR

"We take them with us on every job because they have more than enough power and they are so easy to handle."



#### RADIO WORKS MANAGER

"Amazed at the power. It's standing up in 24 hour service where larger, heavier tools have fallen."

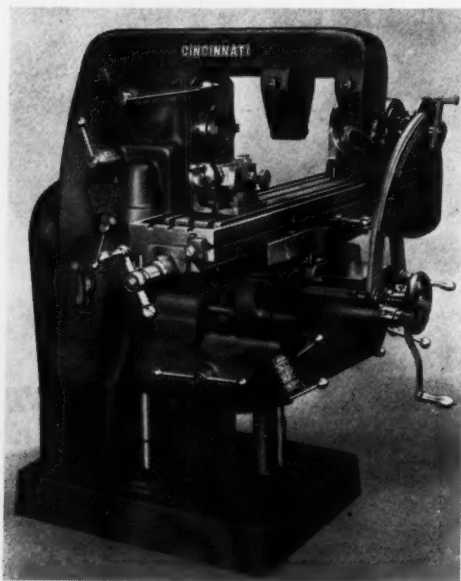


INDEPENDENT PNEUMATIC TOOL CO., 610 W. JACKSON BLVD., CHICAGO  
NEW YORK TOOL MAKERS SINCE 1893 SAN FRANCISCO

## New Shop Equipment

### New Cincinnati No. 2 L-Type Universal Miller

The new Cincinnati No. 2 L-Type Universal Miller, manufactured by The Cincinnati Milling Machine Co., Cincinnati, Ohio, and exhibited for the first time at the recent Cleveland Machine Tool Show,



Cincinnati No. 2 L-Type Universal Miller

is a tool room miller specially designed for job-shop quantities of the average type of milling machine work.

This machine has fifteen spindle speeds, ranging from 23 to 1200 r.p.m., arranged in approximate geometrical progression. The tooth profiles of the complete spindle drive are finished after heat-treating, producing quiet operation at all speeds. Selection of speeds is by means of two levers located on the left-hand side of the column and within easy reach of the operator when he is standing in front of the machine.

Feed rates are selected by shifting levers on the left-hand side of the knee. Twelve feeds are available, the longitudinal travel ranging from  $\frac{1}{4}$  to 30 in. per minute. Lower feed series can be obtained. Feeds may be engaged from the front or rear working position, while the spindle is stationary, running, or actually under cut.

A 3 h.p. motor enclosed in the column drives the machine through V-belts which are adjusted for stretch and wear by means of the hinged motor base. Complete accessibility of the motor, an important consideration in any machine tool, is obtainable by opening the hinged cover on the rear of the column.

Power rapid traverse is available in six directions, the longitudinal travel being at the rate of 100 in. per minute. Immediately upon release of the rapid traverse lever the motion of the unit under consideration changes to a feed rate.

The spindle mount is the proven Cincinnati construction of a double row anti-friction front bearing and an anti-friction self-compensating rear bearing. The center of the spindle conforms to the No. 50 National Standard. A multiple disk type brake instantly stops the spindle when the starting lever is disengaged.

The direction of spindle rotation may be reversed by means of the motor reversing lever on the side of the column, which stops, reverses and starts the motor. An interlock prevents the motor from being started again until it has actually stopped and reversed.

This device increases the efficiency of the spindle drive, because reversing gears are eliminated.

Lubrication of the machine is efficient. Oil-shot systems lubricate the moving parts in the knee, saddle, and table while the parts within the column are lubricated by a splash system.

Convenience of operation has been carefully considered in the design of this machine. All control levers are within easy reach of the operator as he stands in his normal operating position in front of the machine.

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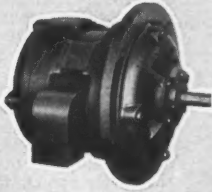
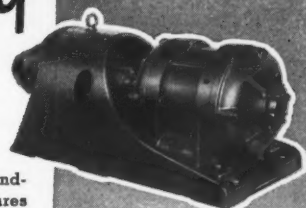
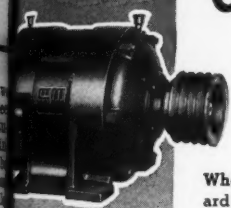
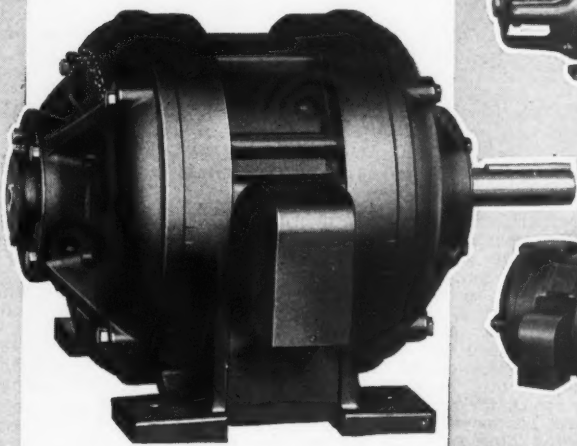
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# NAME YOUR MOTOR REQUIREMENTS

## We supply them!

Whether your motor requirements are standard or special, or whether the desired features concern mountings or electrical characteristics makes no difference . . . we supply your motor needs and do so with performance plus.

All the knowledge gleaned from more than 45 years of pioneering in the building of motors and all the experience acquired in producing motors for its own vast line of rugged power driven machinery is the inheritance of Allis-Chalmers Motors today. That knowledge, that experience and the guiding principle of quality as an ideal are built into every Allis-Chalmers Motor. They are the sturdiest motors on the market—bar none. • Allis-Chalmers district offices in all principal cities are ready to assist you in all problems of motor application for standard or special drives.



# MOTORS

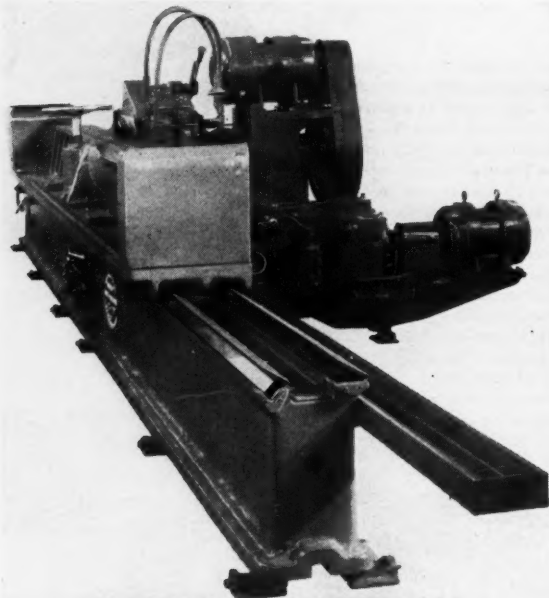


ALLIS-CHALMERS MFG. CO.

MILWAUKEE, WISCONSIN

## No. 75 Bridgeport Face and Shear Blade Grinder

The No. 75 Bridgeport Face and Shear Blade Grinder shown in the illustration is said by the manufacturer—The Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.—to be the result of



No. 75 Bridgeport Face and Shear Blade Grinder

50 years experience in the manufacture of grinding machines. The machine is adapted for the accurate grinding of flat surfaces in general, either by the holding of work to the table itself, or in a special fixture, or by the use of magnetic chucks. As illustrated, the grinder is equipped for the grinding of shear blades. The center section is a double face center controlled revolving magnetic chuck for holding flying shears and other knives with beveled edges. For grinding long squaring shears, the revolving bar is lined up with the angle bar sections on the ends of the table.

The work table operates on vee and flat ways, which are equipped with a forced feed lubrication system. This system provides very efficient lubrication from an oil reservoir in the bed

through the operation of a double acting type oil pump not only to the ways but also to the bearings in the bed of the machine. The oil is filtered after it is returned to the reservoir.

An Oilgear hydraulic pump and motor provide a dependable means of driving the carriage at any desired speed

up to 90 ft. per minute. This speed of the carriage can be changed at the will of the operator by simply turning a hand wheel.

The spindle, which is of large diameter, is equipped with Timken bearings which are positively lubricated by a circulating lubrication system. The wheel is a Bridgeport Sectional Wheel, mounted in a steel chuck. The wheel is easily dressed when necessary by the use of a dresser that is mounted on the wheel guide. Movement of the wheel to the work is controlled hydraulically and an adequate supply of coolant is provided through two nozzles. A hose is attached to the supply line for cleansing the face of the chuck.

## Grant No. 120A Multiple Spindle Type Noiseless Rivet- Spinning Machine

The No. 120A Grant Noiseless Rivet-Spinning Machine shown in the illustration, equipped with a four-spindle head for spinning heads on four posts in a clock frame simultaneously, has been developed by The Grant Mfg. & Machine Co., 96 Silliman Ave., Bridgeport, Conn. The four-spindle head is driven by a vertical direct-connected motor placed at the top of the machine.

On the table of the machine is mounted a fixture which slides out in front for easy assembly of the clock frame parts. When the assembly is in place, the fixture is pushed back to position for riveting, the operator steps the foot treadle which automatically clamps the assembly in position, and completes the riveting or spinning operation. The complete cycle of opera-



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# The QUIET, SHOCK ABSORBING UNIT IN THE DRIVE!

Formica provides a drive unit that is quiet, elastic enough to absorb shocks, and strong and durable.

Noise creates resistance against the sale of machines, and by eliminating grind and screech of metal to metal contacts Formica makes machines more saleable.

It helps the maintenance engineer to keep everything running sweetly and smoothly.

These are the reasons why the use of Formica gears grows steadily — why the quantity sold is as great now as in 1929.

**THE FORMICA INSULATION CO.**

640 Spring Grove Ave.

Cincinnati, Ohio

**FORMICA**

**NON METALLIC  
GEARS**

## FORMICA GEAR CUTTERS

- The Akron Gear & En'g Co., Akron, Ohio
- Farrell-Birmingham Co. Inc., Buffalo, N. Y.
- Slaysman & Company Baltimore, Md.
- Harry A. Moore Bangor, Me.
- The Union Gear & Mch. Co., Boston, Mass.
- The Atlantic Gear Works New York City
- Chicago Rawhide Mfg. Co. Chicago, Ill.
- Perfection Gear Company Chicago, Ill.
- The Mechanical Specialty Mfg. Co., Chicago, Ill.
- Merkle-Korff Gear Co., Chicago, Ill.
- Chicago Gear Company Chicago, Ill.
- The Cincinnati Gear Co. Cincinnati, O.
- The Horsburgh & Scott Co., Cleveland, O.
- The Stahl Gear & Machine Co., Cleveland, O.
- The Master Electric Co. Dayton, O.
- The Adams Company Dubuque, Ia.
- The Ferguson Gear Co. Gastonia, N. C.
- Hartford Special Mch'ny. Co., Hartford, Conn.
- Beatty Machine Works Keokuk, Ia.
- The Generating Gear Co. Milwaukee, Wis.
- Badger State Gear Co. Milwaukee, Wis.
- Precision Machine Co. Milwaukee, Wis.
- E. A. Pynch Co. Minneapolis, Minn.
- Joaquin Alemany Lopez Havana, Cuba
- New Jersey Gear & Mfg. Co., Newark, N. J.
- J. Morrison Gilmour 151 Lafayette St. New York City
- Sier-Bath, Inc. New York City, N. Y.
- E. M. Smith Machine Co. Peoria, Ill.
- The Eagle Gear & Mch. Co., Philadelphia, Pa.
- Rodney Davis and Sons Philadelphia, Pa.
- The Pittsburgh Machine & Supply Co. Pittsburgh, Pa.
- Standard Gear Co. Pittsburgh, Pa.
- H. W. Honeyman & Son Providence, R. I.
- Perkins Machine & Gear Co., Springfield, Mass.
- Winfield H. Smith Inc. Springville, N. Y.
- Alling Lander Company Sodus, N. Y.
- Charles E. Crofoot Gear Corporation South Easton, Mass.
- Arlington Machine Co. St. Paul, Minn.
- Farwell Mfg. Co. Toledo, O.
- Dieffendorf Gear Corp. Syracuse, N. Y.
- Worcester Gear Works Worcester, Mass.
- Massachusetts Gear & Tool Co., Woburn, Mass.



**Grant No. 120-A Multiple Spindle Type Noiseless Rivet-Spinning Machine**

tion requires less than 2 seconds of time.

Power for the operation of the automatic clamping mechanism and for bringing the four-spindle head down to perform the riveting operation is furnished by a horizontal motor mounted at the rear of the machine near the floor. The head can be built with from two to six spindles, depending upon the diameter of the rivets to be spun and the center-to-center distance required. Both motors are operated from the same switch.

### **Hill Hydraulic Vertical Grinder**

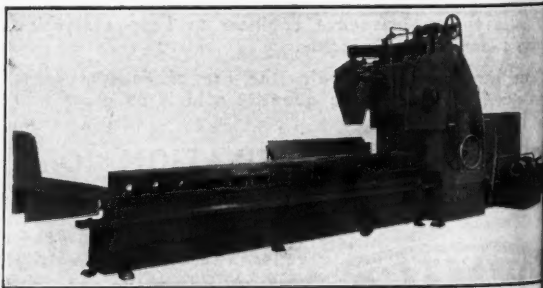
The Hydraulic Vertical Surface and Shear Blade Grinder shown in the illustration has been placed on the market by The Hill Clutch Machine & Foundry Co., 6400 Breakwater Avenue, Cleveland, O. The machine is especially intended for the precision grinding of flat surfaces

and shear blades and it is stated that due to the vertical spindle and compact construction of the vertical column and spindle mounting, the machine will grind flat surfaces within a tolerance of 0.0005 in. Provision is made in the design for tilting the head to grind concaves within the maximum periphery of the grinding wheel. All machine controls are available from the operator's station.

The machine will handle work up to 2 in. wide, with a range of lengths from 86 to 216 in. Maximum distance between the face of the grinding wheel and the platen is 25 in. The table is operated by a motor-driven hydraulic drive, a Vickers Pump supplying oil under pressure to two opposing cylinders. The platen is 28 in. wide, the length being in accordance with the range of the machine. The platen has three T-slots arranged on 10-in. centers, for  $\frac{1}{2}$ -in. bolts. The speed of the platen is instantly variable from 0 to 90 ft. per minute. The wheel spindle, which is mounted on Timken roller bearings, operates at a speed of 600 r.p.m. Positive, automatic maintaining lubrication is provided for the spindle.

The wheel is of the sectional type, 18 in. in diameter. A special quick action chuck, arranged for holding the diamond type of blocks, is provided. The type of sectional or ring wheel will be mounted at the request of the customer. Rapid traverse power feed, using a geared motor, is provided, with a hand feed for fine adjustments. A dial graduated in thousandths of an inch is standard equipment.

Spindle motor is 25 h.p., 1800 r.p.m., either A.C. or D.C. The motor for the hydraulic drive is  $7\frac{1}{2}$  or 10 h.p. at 1800 A.C. or D.C. For rapid travel of the wheel head, a 2-h.p. geared motor is provided. The coolant pump is of the



**Hill Hydraulic Vertical Surface Grinder**

**STRONG — STURDY — FAST CUTTING  
INDIVIDUALLY TESTED—GUARANTEED**

# RED TANG FILES

The Red Color Trade Mark now enables you  
at a glance to select these high quality Files.  
Sold by leading Supply Dealers.

**Simonds Saw and Steel Co.**

*Established 1832*

ITCHBURG, MASS.

CHICAGO, ILL.



## Machine Counters

There is a *Productimeter* for counting or measuring the output of almost any production machine.

- Stroke and Revolution counters in several types and sizes adapted for machines, conveyors, hoppers, engines, scales, looms, presses, pumps, stokers, compressors, etc.
- Quick Reset counters for rapid, accurate handling of short runs.
- Predetermined counters for giving a signal or stopping machines when a pre-set total is reached.
- Double Deck counters recording current runs and daily totals.
- High Speed counters capable of recording up to 5000 r. p. m.
- Lineal Measuring counters for wire, cord, textile, paper, and woodworking machinery.
- Electrical counters for light contacts, irregular objects, remote control, and difficult locations.

*Tell us what you want to count.*

## DURANT MFG. CO.

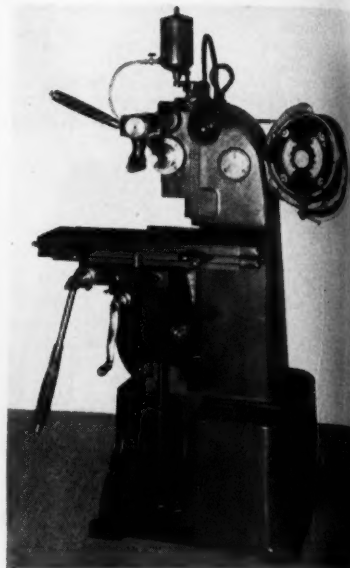
1932 N. Buffum St. 173 Eddy St.  
Milwaukee, Wis. Providence, R. I.

**Productimeters**  
THE MEASUREMENTS OF INDUSTRY

rect connected motor driven vertical spindle type. The coolant supply tank has a capacity of 75 gallons.

## Whitney 1935 Hand Milling Machine

Correct size and easy operation, quickness of set-up, simplicity, ruggedness, power and rigidity are features of the Whitney 1935 Hand Milling Machine shown in the illustration. This machine, a product of W. H. Nichols, Waltham, Mass., is also said to afford the maximum of precision and accuracy. It



Whitney 1935 Hand Milling Machine

especially intended for milling operations on small parts.

The castings used in the construction of this machine are aged after machining so that inaccuracies due to warp and release of strain in the castings will be eliminated. All guiding and bearing surfaces are carefully ground in; thus the slides and spindle are able to align to a degree found only in the finest American milling machine practice. The working surface of the table is  $4\frac{1}{4}$  in. x 21 in. with a standard T-slot in the center. It is equipped with oil pockets and micrometer stops. Adequate illumination is provided by an adjustable reflector lamp.

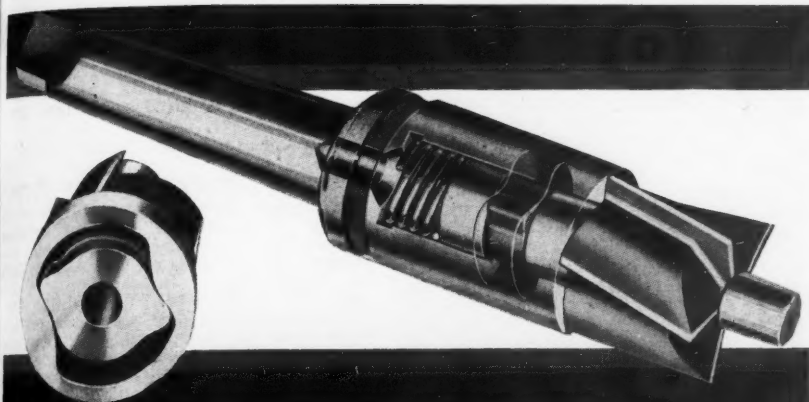
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# CONTINENTAL INTERCHANGEABLE BALANCED DRIVE COUNTERBORES

Simplicity of design, appearance, and operation are outstanding characteristics of Continental Counterbores. Drive is by integral formed lugs with annular bearings on each end of the drive. The form of each set of lugs is such that the action is to compress the metal rather than to exert a shearing action, providing an indestructible drive.

Cutters are engaged and disengaged simply by rotating a quarter-turn by hand. Both sides of the driving lugs are the same shape, so that each holder will drive either right or left-hand cutters.



Cutters are designed to permit maximum chip clearance without sacrificing efficiency. In addition to standard holders and cutters, all types of special holders and cutters can be provided to meet production requirements. New Counterbore catalog upon request.

# EX-CELL-O

AIRCRAFT & TOOL CORPORATION DETROIT, MICHIGAN

A longitudinal feed of 10 in. is provided. The transverse feed is 7 in. and the vertical feed of the knee,  $13\frac{1}{2}$  in. Vertical movement of head,  $4\frac{1}{2}$  in. The table can be brought up to the center line of the spindle. Transverse and vertical feeds are equipped with micrometer dials, and a hand-set stop is provided for the vertical movement of the head.

The spindle, which is of hardened steel, is carried on Timken precision taper bearings. The spindle nose has the new Milling Machine Standard Taper of  $3\frac{1}{2}$  in. to the foot, a construction which allows the tool to easily be removed by hand by merely loosening two cams. Four spindle speeds of 100, 200, 650 and 1200 r.p.m. are obtained by means of interchangeable double ratio sheaves.

The machine is driven by a master  $\frac{3}{4}$ -h.p. constant speed geared head motor which can be furnished for any of the usual voltages in either A.C. or D.C. For light-socket operation, a  $\frac{1}{2}$ -h.p. single phase unit is available. Drive to the spindle is through a double V-belt which is not only adjustable for tension

but is also maintained in constant tension regardless of the position of the head. The motor is reversed by means of a built-in drum switch. The height of the machine is 60 in. and the floor space required is 39x33 in. Weight, 1000 pounds.

### "Toledo" Straight Column Press

The press shown in the illustration is one of a series of straight column presses that has been placed on the market by the Toledo Machine and Tool Co., Toledo, Ohio. Improvements in design and in the selection of proper materials to give the best possible results have been the features of the new line of presses. The design is symmetrical and is characterized by the absence of projections of any kind beyond the base of the press.

Particular attention is called to the design of the crown, which has been heavily reinforced by making provision to extend the tie-rods through the top of the arch. The bed, uprights, and slide have been strengthened, the diam-

## ... but what are you doing about Oil Dermatitis?

**Y**OU spend many a dollar protecting your plant from Fire. Without such safeguards, your business is in constant danger. But what protection do you have against Oil Dermatitis? A single germ, infecting cutting oil, can put your entire force under doctors care . . . cripple production, . . . cause compensation payments. Adding Derma-San to cutting oil prevents Oil Dermatitis. Like fire insurance, it offers protection you cannot afford to be without.

**The HUNTINGTON LABORATORIES, Inc.**  
HUNTINGTON, INDIANA



**DERMA-SAN IS EXCELLENT FOR ALL GENERAL PLANT SANITATION**



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# Automotive Industry

## Norton Grinding Wheels and Abrasives

Automotive production men are keen of grinding wheel performance—widespread preference for Norton is based on definite reasons. Some are:

### complete line of wheels:

tiny mounted points for intricate die to 42" diameter crankshaft wheels—that are right for the job in abrasion, grain, grade and structure.

### expert engineering service:

not enough to have a variety of wheels we must be men who know how to select and apply them. There are trained men in the field and back of them the engineering and research facilities of the Worcester organization.

### large wheel stocks and manufacturing facilities:

Detroit, Chicago, and Cleveland there are well-stocked Norton warehouses to meet the rigid delivery requirements of the automotive industry. And back of these warehouses is the Worcester plant\* with its mammoth stocks and its modern manufacturing equipment.

9 hours from Detroit by express—44 by freight.



DIE GRINDING



GRINDING CAMSHAFTS

### NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh  
Hartford Cleveland Hamilton, Ont. London Paris  
Wesseling, Germany

ASIVES

if

- You need a compact power drive with extreme flexibility in design and mounting arrangements.
- You are interested in reducing cost by eliminating gear trains, chains and sprockets, bearings, couplings . . . by lowering assembly costs.
- You desire to increase greatly the sales appeal of your machine by the elimination of bulky, awkward reduction units of older types.

### . . . use MASTER Geared Head Motors

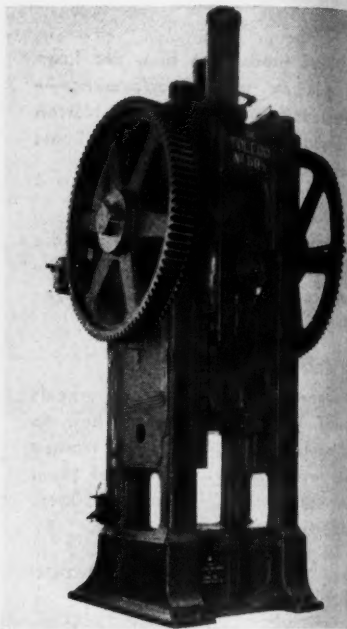
More than 1000 manufacturers of machines supply them as standard.



**The Master Electric Company**  
Dayton, Ohio

eter of the tie-rods has been increased and the crankshaft is of the semi-eccentric type with an extra large crank pin and heavy cheeks firmly supported close up to the frame of the press.

Bearing brackets have been eliminated by mounting the flywheel and clutch mechanism high up between the uprights. Gear guards are furnished, some of the brackets for which may be seen



"Toledo" Straight Column Press

in the illustration. Floor space required has been reduced to a minimum, which is an important feature in the production plant.

Materials of which the various parts are built have been selected for durability. The frame castings are of a special high alloy mixture of great strength and surface hardness, making possible the maximum of rigidity of the base, crown, uprights, and slide members. The crankshaft is of a specially selected grade of steel and the area of the crank pin is 50 per cent greater than the main bearings.

The clutch is of a patented air type and is mounted in the flywheel wheel

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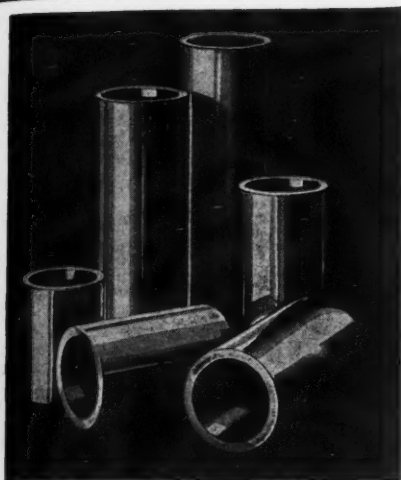


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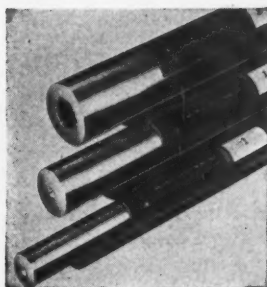
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**S**HOP men everywhere are turning to the Bunting catalog whenever they require finished bronze bearings. There are over 500 sizes of Bunting Bronze Standardized Bearings completely machined and finished, ready for assembly. One or one million are instantly available from stock carried in all Bunting warehouses. Range of sizes and styles meets every usual application in mechanical production and maintenance at tremendous savings in money, time and trouble. Write for this catalog and try it on your next job.

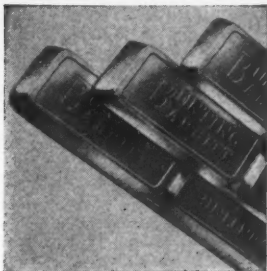
THE BUNTING BRASS & BRONZE COMPANY, TOLEDO, OHIO  
Branches and Warehouses in All Principal Cities

**BUNTING**  **Quality**  
**BRONZE BUSHINGS • BEARINGS**  
**MACHINED AND CENTERED BRONZE BARS**  
**ANTI-FRICTION METAL**



### Bronze Bars

● Ask the Bunting mill supply wholesaler in your city for Bunting Machined and Centered 13" Bronze Bars the next time you buy bearing metal. There are 121 stock sizes. Catalog on request.



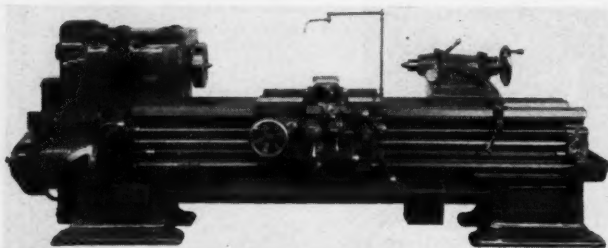
### Babbitt

● If you use industrial Babbitt try a bar of Bunting Babbitt and learn how modern metallurgical science has improved this ancient metal. The Bunting mill supply dealer can serve you.

electric push button control, which enables the operator to stop or start the press at any point of the stroke or to inch the slide when setting or testing dies. The press has a 16-in. stroke with a 6-in. adjustment by power. The slide is 24x35-in. and is counterbalanced by two air cylinders at the top of the crown. The bed area is 50x54-in., and the weight of the press is approximately 150,000 lbs. The press is driven by a direct connected motor.

### Springfield 20-In. Heavy Duty Ball-Bearing Geared-Head Engine Lathe

The illustration below shows a new Heavy Duty 20-inch Ball-Bearing Geared-



Springfield 20-In. Heavy Duty Ball-Bearing Geared-Head Engine Lathe

Head Engine Lathe with Timken Bearings on the spindle as manufactured by The Springfield Machine Tool Company, Springfield, Ohio. This machine was designed to take heavy cuts with high speed steel and high speed cuts with Carboloy. It was shown and demonstrated at the Machine Tool Show in the Cleveland Public Auditorium from September 11th to 21st.

The sixteen speed headstock is of

massive design with either helical or spur gear trains, with pump to spray oil over the gears, shafts and bearings. The oil reservoir, instead of being located in the bottom of the headstock, is now carried in the first pocket of the bed, oil being pumped up from there through filters.

The reversing mechanism for the lead screw is now mounted on the rear of the headstock and can be readily examined; and one of the greatest features of this design is that it allows much heavier gears and shafts to be used. All of these gears are suspended on ball bearings and run in oil.

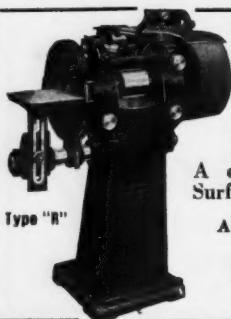
A new heavy duty gear box is attached giving thirty-six changes of threads and feeds, including 11½ pitch.

The apron is of entirely new design with a front plate which can be removed, thereby allowing examination of all working parts. It also allows for a complete box construction of this unit making for great strength and accuracy. The oil pump and reservoir are carried in same

lubricating all bearings in the apron carriage and lower slide of compound rest.

The carriage and compound rest have been made intentionally long and broad with ample bearing surfaces to carry exceedingly heavy pressures. This same idea has been carried into the tailstock and this machine has the heaviest tailstock ever designed for lathes of this size.

The bed is in proportion to all other



Type "R"

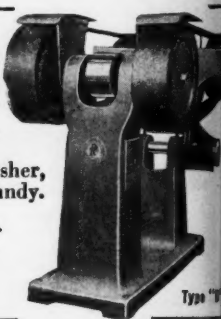
## PRODUCTION Polishing Machines

save time and money and improve your product.

A combination Ball Bearing Polisher, Surfacer and Disc Grinder. Very handy.

Also Single or Double Wheel Polisher.  
Other Types

Production Machine Co.  
GREENFIELD, MASS.



Type "Y"

November, 1935

# Highest Quality

Nicholson Files have teeth that take hold of metal instantly . . . teeth that are made to meet conditions as they actually exist in industrial plants.

Nicholson Files give longer service; they speed up filing operations; they make a good mechanic even more valuable to his employers. Every Nicholson File is made exactly like all other Nicholson Files of its type . . . alike in steel, teeth, shape and appearance.

These things—fast cutting, durability and uniform quality far beyond what you might reasonably expect are what we mean when we say Nicholson Files are "Highest Quality." At hardware wholesalers and mill supply dealers. Nicholson File Co., Providence, R.I., U.S.A.

**NICHOLSON**  
U.S.A.  
MADE IN U.S.A.

*Genuine*

**NICHOLSON  
FILES**

A FILE

FOR EVERY PURPOSE

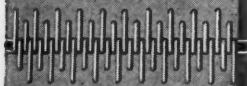
Type "B"



# Clipper Carded Belt Hooks

*Safest to handle  
Safest in operation  
They wear longer  
They cost less*

For lasting belt joints  
modernize your  
lacing equipment  
— use Clipper



# Clipper

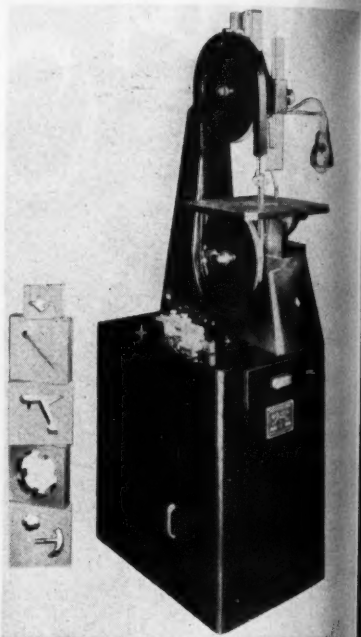
**Belt Lacer Company**  
Grand Rapids, Michigan

units, weighs 290 pounds to the foot and is 20¼ inches across the vee.

This machine possesses a 10-horsepower motor. Shipping weight on a 10-foot bed is approximately 9,000 pounds.

## Continental Do-All Combination Band Filing and Sawing Machine

Among the new machines on exhibition at the Cleveland Show was the Continental Do-All Combination Band



Continental Do-All Combination® Band Filing and Sawing Machine

Filing and Sawing Machine shown in the illustration. This machine, which is built by Continental Machine Specialties, Inc., 1301 Washington Avenue South, Minneapolis, Minn., is a dual purpose machine and is so designed that it can be changed from a band filing machine to a band sawing machine in vice versa in less than three minutes.

The filing operation is performed with a file band made up of 3-in. segments of files which are mounted on a flexible spring steel band. The flexible band runs over the pulleys, while the



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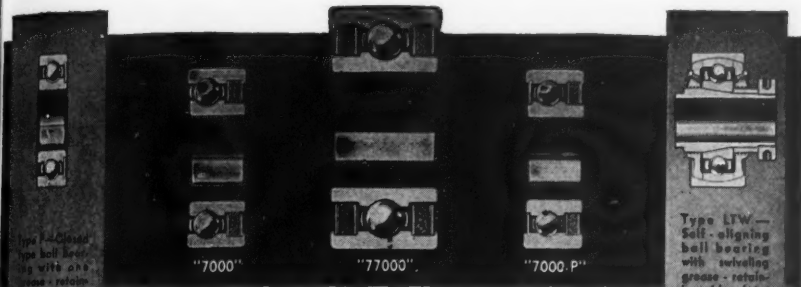
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# SELF-SEALED

Out of their experience of more than 23 years, NORMA-HOFFMANN engineers — pioneers in the design of enclosed and self-protected bearings — have developed and patented a range of types which meets practically every bearing condition and which affords the mechanical world

## The Most Complete Line of SELF-PROTECTED BEARINGS in America

The "GREASEAL" Series of Felt-Protected Ball Bearings—in the three types illustrated above—is marked by the following outstanding features which make for better performance and more lasting satisfaction:— thick, closely-fitting felts between removable plates forming an effective labyrinth against the recessed inner ring --- FELT SEAL REMOVABLE in its entirety for inspection, cleaning or renewal of grease --- wide, solid inner and outer rings, with maximum contact on shaft and housing, make inserts in housing unnecessary and militate against slippage, looseness, and escape of lubricant past outer ring --- felt seal within confines of both rings and not exposed to injury --- constructional characteristics assuring dimensional exactness and quiet running --- grease capacity ample for long periods of service. . . . Eight other types of Self-Protected PRECISION Bearings are here pictured and indexed. Write for the complete Catalog. Let our engineers aid you in selection and application.

**NORMA-HOFFMANN BEARINGS CORPN.**

**STAMFORD, CONN., U. S. A.**

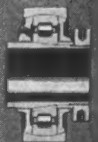
# "NORMA-HOFFMANN" PRECISION BEARINGS

**BALL, ROLLER AND THRUST**

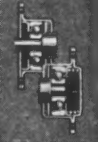
Type LTW —  
Self-aligning  
ball bearing  
with swiveling  
grease-retain-  
ing side plates  
and adapter  
discs.



Type RLSW —  
Self-aligning  
roller bearing  
with swiveling  
grease-retain-  
ing side plates



Type RLW —  
Self-aligning  
roller bearing  
with swiveling  
grease-retain-  
ing side plates  
and adapter  
discs.



CUP MOUNT-  
ING - D. —  
Designed to use  
with small open  
type ball bear-  
ings in high-  
speed service.

Type 7000 —  
Self-aligning  
ball bearing  
with one  
grease-retain-  
ing plate.



Type 77000 —  
Self-aligning  
ball bearing  
with two  
grease-retain-  
ing plates.



Type 7000-P —  
Self-aligning  
ball bearing  
with one  
grease-retain-  
ing plate.



Type EGI —  
Adjustable  
nit-protected  
grease-packed  
ball bearing.

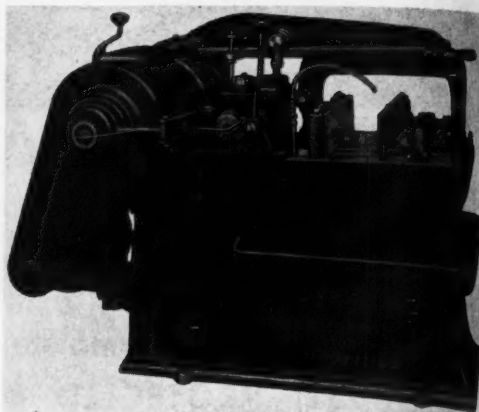
files maintain alignment. It is stated that the file bands will not stretch and every inch of file is used. This method of filing makes possible continuous operation and eliminates the back stroke. A steady pressure is possible due to uninterrupted cutting, making it easy to follow a line.

The sawing is accomplished by a band saw similar to the type in general use. However, inside sawing and filing can be done, the file band being passed through the work by uncoupling the band at a point where a bayonet type of joint is provided and hooking the band together after it has been inserted through the hole to be filed. Inside sawing is accomplished by cutting the band saw blade, inserting one end through a starting hole in the work and rewelding the blade in a self-contained automatic electric welding device. Thus it is possible to saw a block out to a layout line and then to remove the band saw, insert the file band, and file to the required finish.

The throat of the machine is 12 in. deep and the work table is 15 in. square. Material up to  $6\frac{1}{4}$  in. thick can be cut. The  $\frac{1}{4}$ -in. saw blade will cut radii of  $\frac{1}{2}$  in. The machine is driven through heavy vee belts and has a variable speed adjustment to provide the ideal cutting speed for each different saw or file and according to the material being cut. An adjustment is provided on the upper wheel for 20 brazes or until the saw is dull and worn out. The work table can be tilted from 0 to 45 deg. in the forward direction or approximately 5 deg. back, the angle being indicated by a graduated scale.

### Racine 6x6-In. Metal Cutting Machine

The Racine Tool and Machine Company, Racine, Wisconsin, has placed on the market an entirely new 6x6-in. metal cutting machine, using hydraulic feed and control. The designers have had in mind the modern trend toward smooth



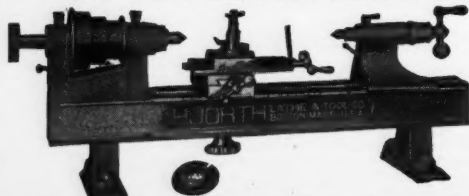
Racine 6x6-In. Metal Cutting Machine

compact construction, with essential parts built in, rather than applied to the machine itself.

Noteworthy is the hydraulic unit, complete in itself and comprising a simple piston pump, single control lever and two graduated dials for feeds and pressures. This entire unit is a sub-assembly, easily removable if desired. No pipe or connections are employed. No leakage of oil can occur as the few exposed bearings are so arranged that oil from bearings is drained back into the main oil reservoir.

A built-in three speed transmission

### ... for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 Beacon St., Woburn, Mass.

# Cutting

Machine Com-  
placed on  
6-in. metal  
hydraulic feed  
have had in  
ard smooth

with hardened steel gears, is completely enclosed and runs in oil. The saw frame has unusually broad bearing areas, so widely spaced that pressure of the blade tends to center the frame above the work.

Actual capacity is 6x6 inches square or 6- $\frac{3}{8}$  inches round with the vise straight and 4 $\frac{1}{2}$ x6 $\frac{3}{8}$  inches with the vise set at 45 degrees, for angle cutting. The slotted table allows chips and compound to fall through into the chip pan away from all moving parts. Machines are made for belt drive or motor drive. The motor is 1 $\frac{1}{2}$  h.p. and drives through two V belts.

A cutting rate of 3 to 4 square inches per minute is claimed in cold-rolled steels. The flexible hydraulic feed automatically adjusts itself to pressures built up against the blade, so that in cutting a round bar the feed is increased at the beginning and end of the cut, resulting in the fastest possible cutting time. The opposite condition occurs in cutting tubing, and it is said that a 3-in. steel tube with  $\frac{1}{4}$  in. walls is readily cut in 40 seconds under constant production conditions.

## Gardner Modernized No. 24-A Horizontal Disc Grinder

The Gardner No. 24 Disc Grinder, which is a standard product of Gardner Machine Company, Beloit, Wis., has been redesigned to provide sturdier construction and a broadening of the work range. The machine is now available with a vertical built-in shaftless motor, as shown in the illustration, or with a flanged motor mounted in horizontal position. In either case the motor drives the vertical spindle through spiral bevel gears.

The machine spindle measures 5.51 in. in diameter and carries a wheel supporting flange or collar 24 in. in diameter, insuring rigid, inflexible support to the grinding member. The rated load of the thrust bearing at the base of the spindle is 22,620 lbs., which is many times in excess of any load which the machine could conceivably be called upon to handle.

The unit is designed to carry heavy duty Gardner Wire-Lokt abrasives, and is also particularly designed to permit wet grinding when this is desirable. In

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**MR. WELL-DRESSED BELT  
INCREASES MACHINE PRODUCTION**

A large plant reports increased machine production of 9% as result of regularly applying Research Belt Dressing. You, too, can turn out more per hour and cut your unit cost by treating belts regularly with Research. Ask your distributor for it or write direct to the Home of Research.

### PRICES

Quart .....	\$1.00
1/2 Gal.....	1.50
Gallon .....	2.75
5 Gal.....	12.50

**GRATON & KNIGHT COMPANY, WORCESTER, MASS.**

# RESEARCH BELT DRESSING

*from the Home of Research*



Gardner No. 24 A 53-In. Horizontal Disc Grinder

wet grinding, a separate settling tank, as illustrated, is furnished. Experience has conclusively demonstrated that unless such a tank with suitable filters is used, it is impossible to prevent a great percentage of the chips and grinding dust from being carried up into the abrasive member. The machine is compact, requires a minimum of floor space, and reflects the most advanced principles of modern machine tool design.

### Gardner "200" Series Single Spindle Disc Grinder

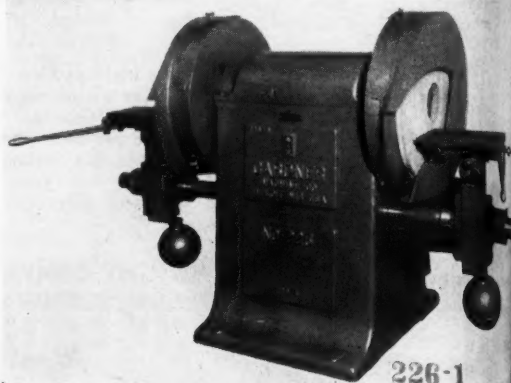
The Gardner Machine Company, Beloit, Wis., has developed a line of Single Spindle Disc Grinding Machines of the most modern design, to be known as the "200" Series. The machines are of sturdy, well proportioned construction, designed to produce flat surfaces rapidly and accurately and to insure continuous service on the work for which they are intended.

The "200" Series Gardner Grinder was developed for two primary purposes; first, to provide a line of motor driven tools each powered by a standard motor mounted on a bracket at the rear of the base rather than by a special built-in motor, and second, to

offer a number of improvements in design over the former disc grinding machines. Another point of advantage is, however, that the spindle speeds may be controlled to give the proper peripheral speed for the grinding wheels.

The base of the grinder is massive, and is so designed that when the motor is mounted on the bracket at the rear, neither end of the motor will extend beyond the end of the base itself. This method of mounting provides a compactness of construction said to be equal to that of a built-in motor tool. The motor is mounted on a swinging plate on a bracket which is provided with screw adjustment so that the tension of the multiple V-belts used in the drive may easily be regulated.

The spindle is of high carbon steel, accurately ground. Wheel collars or flanges are large and heavy, measuring exactly one-half the diameter of the disc wheel itself and thus insure rigid, inflexible support to the grinding member. The spindle is mounted in pillow blocks, each of which carries two oversize preloaded ball bearings. One pillow block is clamped in position and the other is allowed to float endwise to take care of spindle expansion and contraction. Bearing caps are removable, thus making replacement of belts a simple task. Labyrinth seals effectively exclude all dirt and dust. Each machine is provided with a push button station mounted in a panel at the front.



Gardner No. 226 Disc Grinder



**THE CUDDY-GARDNER Co.**  
SUCCEEDING THE  
**TAFT MACHINE Co.**  
ESTABLISHED 1870  
MANUFACTURERS OF

TAFT CARPET  
SEWING MACHINES

SPECIAL  
MACHINERY

**DISPLAY RACKS**  
PROVIDENCE, RHODE ISLAND, U. S. A.

June 20, 1935

ATTENTION C. O. HEDNER

The Yale & Towne Mfg. Co.  
Philadelphia, Pa.

Gentlemen;

Upon receipt of your favor of the 18th we looked up the record of the ONE TON YALE & TOWNE HOIST, for which we received some repair parts the other day, and find that the purchase was made on May 2, 1916.

Therefore, this hoist has been in constant use for nineteen years and the parts just furnished are the only ones with the exception of one other ratchet and pawl that were replaced about ten years ago, after some of our employees had overloaded the hoist.

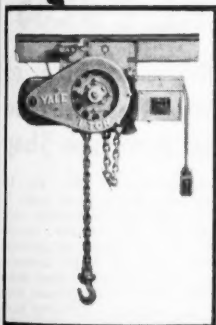
We believe it would be almost impossible to make extravagant claims for the durability of this device.

Very truly yours,

The Cuddy-Gardner Company

*W. T. Gardner*

TREASURER



and that's  
**Service**

.... 19 years in service at  
a cost of less than 1/4 of a  
cent a day for maintenance. *plus!*

Yale Electric Hoists speed up production, insure safety and promote economies in materials handling operations—send the coupon.

The Yale & Towne Mfg. Co., Philadelphia Division  
1322 Tacony Street, Philadelphia, Pa.

Gentlemen:

Kindly send me the illustrated folder containing detailed information with regard to YALE Electric Hoists.

Name of Firm.....

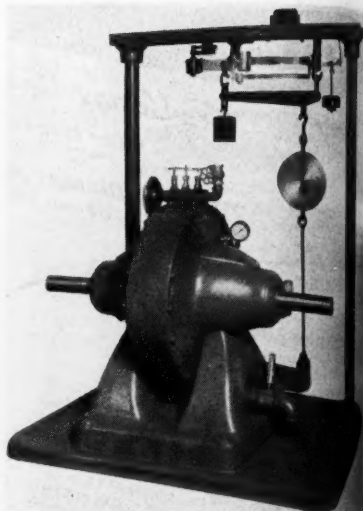
Individual..... Title.....

Address .....

The machine is supplied in four sizes with discs varying from a minimum of 10 in. diameter on the smallest machine to 30 in. on the largest. The height of the spindle from the floor is 40 in. in all cases. Motors recommended are 5 h.p., 10 h.p., 15 h.p., and 30 h.p. for the several sizes respectively. Weights are 1600 lbs., 2500 lbs., 3450 lbs., and 4775 lbs. Spindle speeds are 1400 r.p.m., 1050 r.p.m., 800 r.p.m. and 700 r.p.m. Safety hoods, constructed of welded steel according to specifications of the American Standards Association, are available for use with Gardner "200" Series Grinders. Gardner Rockershaft Supports are also available for use in supporting the outer ends of the rockershafts when heavy duty work is being handled. The rockershafts insure greater freedom from vibration than is possible without them.

### Taylor "Hi-Eff" Dynamometer

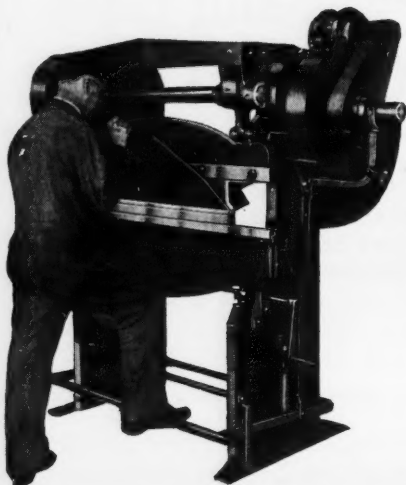
The Taylor Manufacturing Corporation, 2332 West Clybourn St., Milwaukee, Wis., has brought out the high speed "Hi-Eff" Dynamometer shown in the illustration. The line of dynamometers made by this company now includes capacities from 1/10 to 10,000 h.p. and speeds from 0 to 25,000 r.p.m.



Taylor "Hi-Eff" Dynamometer

The design of the "Hi-Eff" machine includes a heavy, rigid, one-piece cradle

## THIS No. 253 CHICAGO STEEL PRESS



**Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop**

This compact, ruggedly built, 48", No. 253 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

Write for Circular No. 253

**DREIS & KRUMP MFG. COMPANY**

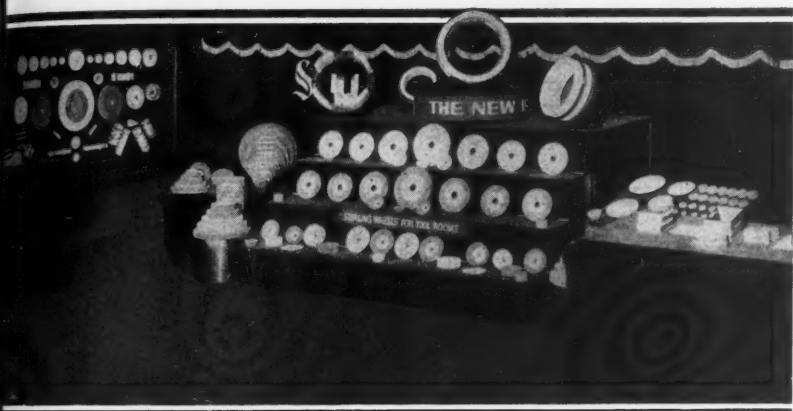
7418 LOOMIS BLVD.

CHICAGO

ILLINOIS



# A DISPLAY THAT TOLD ITS OWN STORY



The wheels shown in this display which many visitors to the Machine Tool Show will remember, were highly complimented because:

- **FIRST:** They were uniform in construction and color.
- **SECOND:** They clearly showed their ability to do the work of any tool-room grinding.
- **THIRD:** They demonstrated that **STERLING** wheels are producers of low cost efficient grinding.

No matter what type of wheel you use, you can depend upon **STERLING** to produce it for you with accuracy and speed.

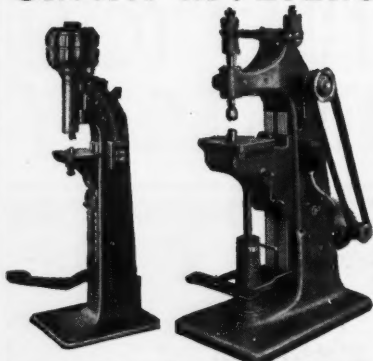
## THE STERLING GRINDING WHEEL COMPANY

Abrasive Division of The Cleveland Quarries Company

Factory and Office: TIFFIN, OHIO CHICAGO: 135 North Wacker Drive DETROIT: 101-107 West Warren Avenue

# STERLING ABRASIVES

## GRANT RIVETERS



● **Pioneers in the riveting field.** Head rivets from smallest to  $\frac{3}{8}$ " diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

**THE GRANT MFG. & MACHINE CO.**  
96 Silliman Avenue Bridgeport, Conn.



## THE NEW SHELDON 11" LATHE

● 11 $\frac{1}{4}$  in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1  $\frac{1}{16}$  in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

**Sheldon Machine Co.**

3253 Cottage Grove Ave.

CHICAGO,

ILLINOIS

base upon which is mounted a precision-balanced alloy rotor for current high speed prime mover testing and production line loading. The rotor is mounted in oversize ball bearings. The combination of correctly proportioned peripheral and side-wall teeth on both the stator and rotor is said to result in remarkable capacities within a comparatively small machine. The indicating dial pointer does not vibrate or flicker, but moves steadily and accurately with the load change. This advantage is obtained through the very smooth torque characteristics of the dynamometer. The micro-intake valves assure close calibration and minimum water consumption. There are no contacting surfaces between the stator and rotor, thus maintenance is reduced to the minimum.

The dynamometer can be completely lubricated and the packing glands may be adjusted while running. This feature is desirable for lengthy life tests when continuous operation is essential. Optional equipment includes tachometers, beam scales, revolution controls, fuel weighing units, engine supports, bed plates, couplings, and automatic control.

## No. 60 Greenerd Hydraulic Forcing, Broaching, and Plastic Molding Press

The Greenerd Arbor Press Company, Nashua, N. H., announces a No. 60 Self-Contained Hydraulic Press with pressure controls from  $\frac{1}{2}$  ton to 15 tons on the down-stroke and from  $\frac{1}{2}$  ton to 15 tons on the up-stroke. The frame and cylinder are constructed of a special semi-steel casting. The piston is of steel with six cast iron rings. The ram gland is packed with chevron-type packings with a bleeder pipe to take care of any seepage plus an extra wiper packing, eliminating a seepage of oil on the ram.

The combination low and high pressure pump is driven by a 3 h. p. motor mounted on the side of the frame with the tank mounted at the rear of the press. The control valve is either hand or foot-operated, and automatic or manual reverse can be made at any point in either direction. When the ram is at top position, the pump by-passes, relieving all pressure.

The No. 60 press is so versatile in its applications that it is difficult to limit them all, but it is particularly adaptable for assembly work, push or pull broaching, keyway cutting, and light plastic molding. The 15-tons down pressure may be held under even pressure

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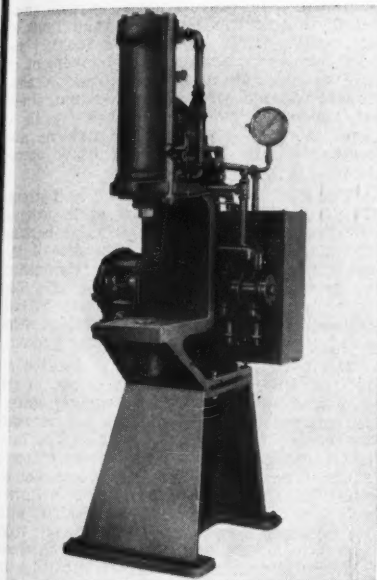
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the plastic sets, then released with a 13-ton pull to open the mold. Adjustments for any desired pressure are easily and quickly made.

The ram travels at a rate of 96 inches per minute under 6 tons pressure, or at 36 inches per minute under 15 tons pressure. A 16-in. cycle, no load, is made in 15 seconds. Six tons on a 16-in.



No. 60 Greenard Hydraulic Forcing, Broaching, and Plastic Molding Press

stroke is obtained in 10 seconds, or 15 tons on a 16-in. stroke in 26 seconds. The height over the table is 16 in.; maximum diameter received, 18 in.; size of work table, 12x12 in. with 3½ in. cored hole.

### Niagara Master Series A 1¾-In. Inclinable Press

The Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y., announces a 1¾-in. diameter shaft inclinable press designed to include many improvements affecting rigidity, strength, accuracy, productive output, longer die life, safety, and low maintenance costs.

Among the advanced features of the press is the design of its one-piece, high

## ALL INDUSTRY DEPENDS ON

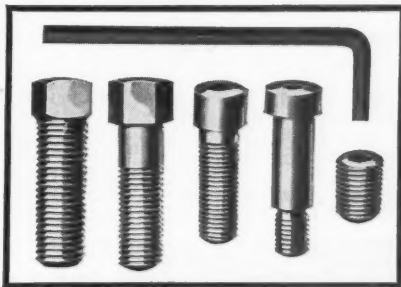
# Mac-its

PRONOUNCED  
"MACK-ITS"

## ..... FOR QUALITY

Mac-it Quality Screw Products . . . are the result of 25 years of experience and special skill in the making of heat-treated alloy steel screws of all types and descriptions. They represent the best in knowledge and use of adequate steels; in modern high-speed automatic machinery and heat-treating equipment; in first-rate mechanical engineering technique and advanced production control methods; and a combination of expert individual craftsmanship with a management that "grew up in the business" . . . is constantly at grips with every detail of operation.

*Make the Mac-it test for quality—sent free on request.*



Typical members of "the Mac-it family."

# THE STRONG-CARLISLE and HAMMOND CO.

CLEVELAND, OHIO . . . NATIONAL DISTRIBUTORS

tensile cast iron frame incorporating scientifically developed cross sections, providing a high factor of safety in regard to its strength, assuring rigidity and resistance to vertical, horizontal and torsional stresses and providing for rig-



Niagara Master Series A 1 1/4-In. Inclinable Press

idity of gib mountings, bearings, back shaft mountings, and stiffness of bed.

The press is equipped with the Niagara 14-point engagement sleeve clutch which was described on Page 86 of the October, 1935 number of MODERN MACHINE SHOP. Driving energy is trans-

mitted to the shaft by 26 internal involute splines generated on the inside of the clutch sleeve. These splines and the corresponding external splines on the shaft are in constant engagement. To prevent excessive forward drift of the shaft if the brake should be too loosely adjusted and to eliminate the possibility of repeating as a result, the throwout spindle encounters an abutment in the clutch sleeve which absolutely stops the sleeve at the limit of allowable drift. A positive locking device presents accidental engagement of the clutch when setting dies. A non-repeat device prevents a second stroke of the slide even when the treadle is held down. This device may be disconnected to allow continuous operation.

The slide is extremely rigid and strong. The solid casting of the slide extends well forward to furnish a solid backing for the mounting and support of the die, providing equal support from center to front and center to rear. The slide is equipped with the exclusive Niagara "Breach Block" die clamp which provides solid support for the die under pressure.

Individual motor drive is located on top of the press where it is out of the way and not subject to damage. Integral planed and drilled pads are provided to receive the motor bracket. The back gearing is high, out of the way of operators, trucks, material in process, and so on. The back gear shaft runs on oversize Timken bearings, and the shaft with its bearings is mounted in a heavy, rigid tubular casing forming a self-contained assembly which is held in position in the press by entering it through two holes which were bored in the frame at the time the main bearings were bored. Thus absolute alignment is automatically assured.

A convenient and easily adjusted inclining device is provided to tilt the press to any desired working position.



## REMCO MOTOR DRIVES

Complete rigidity—no overhang—no strain on beds, frames, etc. Universal motor mounting—use any motor—not built special. Change from one tool to another if desired. V Belt or Chain drive from motor. Complete guards—quick belt adjustment. Complete line of Drives from Hack Saws to 42" Lathes, etc.—Quickly applied.

Complete Literature on Request

**MANLEY PRODUCTS CORPORATION**  
YORK, PENNSYLVANIA

# "ROCKWELL" HARDNESS TESTER



**THE MONARCH MACHINE TOOL CO.**  
Sidney, Ohio, U. S. A.

Wilson Mechanical Instrument Co., Inc.,  
383 Concord Avenue, New York, N. Y.

August 2, 1935.

Gentlemen:

Thinking you might be interested in a striking photograph showing your "ROCKWELL" Hardness Tester in use, we are attaching hereto such a photograph.

We are going to use this photograph together with several others in a new bulletin we are issuing shortly showing the sort of equipment we use in our testing department.

Yours very truly,

THE MONARCH MACHINE TOOL CO.  
W. E. Whipp (Signed)

Concord Ave. and East 143rd St., New York

**WILSON**  
MECHANICAL INSTRUMENT CO., INC.

The 1 $\frac{3}{4}$ -in. shaft has a 3 $\frac{3}{4}$ -in. eccentric and runs in bearings which are split at an angle of 45 deg. from the vertical. The entire thrust is transmitted through to the frame instead of being partly transmitted to the caps, thus assuring a true bearing. The brake is equipped with a spring that automatically compensates for expansion due to heat of operation as well as for wear.

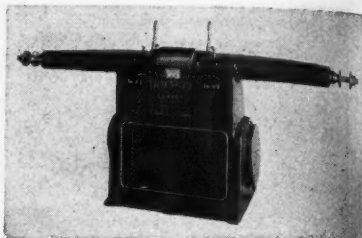
### Hammond Automobile Fender Polishing Lathes

The Hammond Machinery Builders Inc., Kalamazoo, Michigan, announce a new line of polishing lathes specially designed for automobile fender polishing, and other work of a similar nature requiring a wide swing lathe.

The accompanying illustrations show two of the most popular models, several of which have been recently installed in some of the larger automobile shops.

The Hammond Model RR Wide-Swing Two-Spindle Two-Motor Polishing Lathe has two independent spindles and two motors in the base, one for each spindle, with V-belt drive from motors to spindles. Made in three sizes for three to

fifteen horse-power motors. Distance from side of base to inside of wheels, up to 30 in. Cut shows Model 5RR with five horse-power motors, spindles 107 in. long overall, distance from side of base

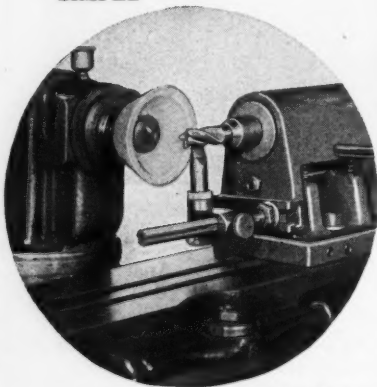


Hammond Model RR Polishing Lathe

to inside of wheels 30 in. Spindles mounted on over-size ball bearings. V-belts can be replaced without removing spindles or disturbing bearings on motors.

The Hammond Model ROEH Wide-Swing Overhanging Spindle Polishing Lathe is designed for automobile fender polishing or other work requiring large working space around wheels. Ten, fifteen

ACCURATE  
SIMPLE



QUICKLY  
ADJUSTED

## CUT END-MILL SHARPENING COST

THE WEL-DON End-Mill Sharpening Fixture cuts reconditioning costs as effectively as Wel-Don End Mills cut cutting costs—and that's "saying something".

### A Few "Highlights"

Rocking head permits mill to be moved away from wheel without changing the setting. Guiding finger insures accurate back-off with single pass. Handles straight-shank steep spiral mills from  $\frac{1}{4}$ " to 2". Extra bushings for taper-shank mills.

Ask Your Nearest Weldon Representative for Details

**THE WELDON TOOL CO.** 321 Frankfort Ave., Cleveland, Ohio



Distance  
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Laths

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d, Ohio

Tool steel filings from  
14-in. Delta flat bastard.  
Enlargement 10 diameters.

## Brass needs SHARP FILES

The well-known shop where  
these brass friction clutch  
plates are made uses Delta  
Files for the best of rea-  
sons—they "bite" with less  
pressure and cut faster.



Every reason of time-economy and file life, that causes Delta Files to be preferred for iron and steel, is increased when the "slippery" metals are encountered. Delta's superior keenness and faster cutting are evident from the first stroke.

Compare Delta filings under a lens with those made by any other file, and you will see why. Every particle is a tiny shaving, like the chips from a sharp lathe tool.

Many machine tests have shown that Deltas *outlast* ordinary files as much as they *outcut* them. Any difference in price is more than earned by the greater amount of metal removed per file. The saving in labor time is pure gain.

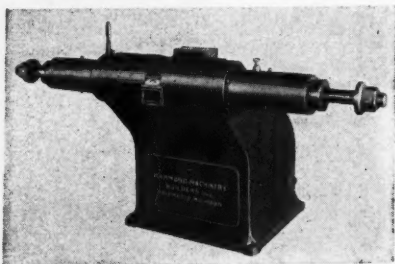
Such files are worth using in *your* shop. Ask the nearest Delta distributor about our trial offer on a dozen files for comparative test.

Tool steel filings made by Delta and non-Delta 14-in. flat bastards, run 3,633 strokes. Delta, 1 side, 189 grams. Non-Delta, 3 sides worn out, 27 grams total. Test bars 1 x 1 in. Pressure 25 lbs., relieved on back stroke.

# DELTA FILE WORKS

4837 JAMES ST. (BRIDESBURG) PHILADELPHIA

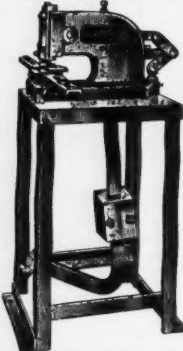
or twenty horse-power motors are mounted in the base, with V-belt drive to spindles. Spindle is mounted on four over-size ball bearings, which can be re-



**Hammond Model ROEH Wide Swing Overhanging Spindle Polishing Lathe**


moved for replacing V-belts without opening bearing housings or disturbing motors. Cut shows Model 15 ROEH with fifteen horse-power motor in base. Spindle has 8 in. overhang from front of base and is 96 in. long overall with distance of 20 in. from side of base to inside of wheels.

**FOOT PRESS No. 28**



Capacity 2" hole in 16 gauge — 100 holes per minute.

**ANGLE IRON SHEAR No. 4**



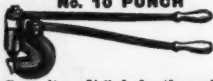
Capacity 2x2x1/4" Angle Iron  
Weight 44 lbs.

**ASK FOR CATALOG No. 9**

•

**80 ITEMS FROM WHICH TO CHOOSE**

**No. 10 PUNCH**



Capacity, 3/4" hole through 1/4" iron. Weight 8 1/4 lbs.

WHITNEY METAL TOOL CO.

91 FORBES ST.

ROCKFORD, ILL.

## H & G Model 2 Threader

The Model 2 Threading Machine shown in the illustration has been designed by The Eastern Machine Screw Corp., 38-58 Barclay St., New Haven, Conn., to supplement the standard H & G Threader made by this firm. It has many of the features of the standard machine, such as simplicity of design, rugged construction, high production possibilities, and small floor space. It is, however, capable of handling larger work and the bed of the machine provides much larger chip space.

The machine is designed so that various types of tall stocks or slides may be used to accommodate second operation or chucking work. Tail stock ways are



**H & G Model 2 Threading Machine**

wide and substantial. The spindle is hardened and ground and clearance is sufficient for die heads up to 2-in. capacity.

The Model 2 Machine illustrated is equipped with variable speed drive and is all electric. Variable speed is obtained by mounting a New Departure "Transitorq" unit in the base, driving the spindle direct through a silent chain. No gears are used in the combination.

reader

Machine  
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# A Condensed Treatise on Gear Manufacture

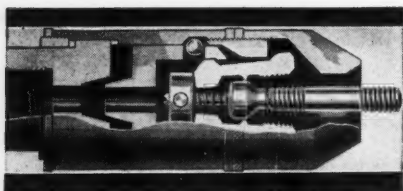


This new book, just printed, is full of practical, helpful information for engineers and operating executives who are responsible for the production of gears.

It will be sent free to such executives who request it on their company letterhead.

**FARREL-BIRMINGHAM COMPANY, INC.**

381 Vulcan St., Buffalo, N. Y.



## High Speed Stud Setting The New Way

The Titan Stud Setter is a new self-opening type for driving stud bolts . . . it is full automatic in loading and releasing. It is a power driven unit adaptable to all types of drill presses and air or electric tools. Positive in driving and automatic in releasing, the studs may be set to any predetermined height desired and without straining or mutilating the threads.



The Titan Automatic Self-Opening Stud Setter provides most outstanding stud setting advantages. It will seat practically any type of stud and is adaptable to very successfully setting studs of extremely short lengths. It provides for increased production due to capacity, speed range and service . . . plus the added economy which its safety features assure by automatic operation. Write for new bulletin.



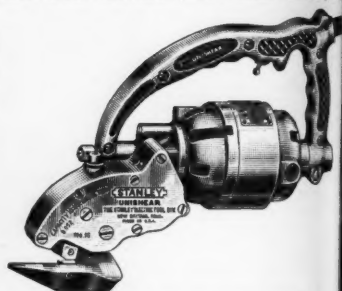
**TITAN TOOL CO.**  
Fairview • Penn.

Any die head speed from 65 to 500 r.p.m. is available by a simple turn of a convenient hand wheel. With this drive constant speed electric pump is provided which maintains uniform flow of cutting oil through the die head spindle regardless of spindle speed.

The above combination makes it possible always to operate the machine at the most efficient speed for the diameter of the work and the machinability of the material. The machine may be ordered for countershaft drive with gears for three speeds or with a simple motor drive and three speeds. Floor space required, 20x36 inches.

## Stanley No. 16 Unishear

A Portable electric shear, to be known as the Stanley No. 16 Unishear, designed for cutting steel up to 16 gage, has been brought out by The Stanley Electric Tool Division, 137 Elm Street, New



Stanley No. 16 Portable Unishear

Britain, Conn. The No. 16 Unishear is similar in appearance to the 18-gage "Mighty Midget" but is said to have almost twice as much power and is accordingly heavy construction. The No. 16 is designed primarily for shops performing continuous production operations on tough sheet materials, or for job shops that cut up to 16 gage rolled steel.

The No. 16 Unishear is said to produce speed in accordance with the feed up to 15 ft. per minute and is stated to cut straight lines, curves, angles, and notches with hair line accuracy without burr or distortion. Inside cuts are easily made after punching a hole for the yoke, and circles or curves as small as 1½ in. may be cut. The No. 16 is 13½ in. long, weighs 10½ lbs., and has a pivoted duplex handle; thus it is easy to manipulate and comfortable to the operator's hands.

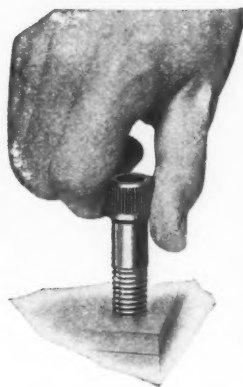
**KNURLED**



ASK  
FOR  
FREE  
SAMPLES

**"UNBRAKO"**

**Socket Head  
Cap Screw**



U. S. & Foreign Pats. Pending

U. S. & Foreign Pats. Pending

Every mechanic, when driving screws, will invariably use his fingers as much as possible, because they are much handier than any wrench and save time.

With the Knurled "Unbrako" he can drive much faster than before, as his fingers actually become geared to the Knurled Head so they can't slip and, therefore, get a much better purchase regardless of how greasy the head might be.

The Knurled "Unbrako" is of exactly the same high quality as the smooth head "Unbrako."

SOLE MANUFACTURERS

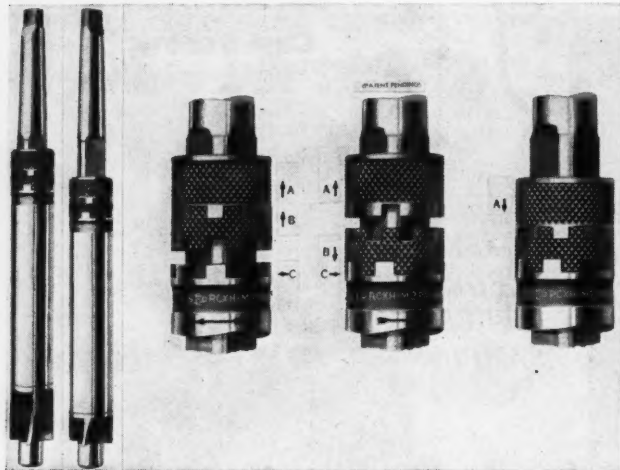
**STANDARD PRESSED STEEL CO.**

Box 556

Jenkintown, Pa.

### Eclipse Variable Length Holder With 0.001-In. Adjustment

The Eclipse Counterbore Company, 7410 St. Aubin Avenue, Detroit, Mich., has brought out a line of variable length cutting tool holders which are said to be



(Left) Eclipse Variable Length Holder before and after adjustment to compensate for tool grinding. (Right) Illustration showing method of adjusting Eclipse Holder.

especially adapted for multiple spindle operations when several holes are to be faced, counterbored, or countersunk to identical depths. These holders eliminate the necessity of maintaining cutters sharpened in sets of the same exact length. The illustration shows a holder with a new cutter, also a holder adjusted to provide the original length

of assembled tool after the cutter has been resharpened several times.

The 0.001-in. adjustment is accomplished by the use of a compensating collar with driving lugs at both ends. The number of lugs on the upper end differs from the number of lugs on the

lower end which engage the holder body. Adjustment is simple, instantaneous, positive and fool-proof and is accomplished entirely by hand. The sequence of movements is as follows: raise collar A and turn together and turn the collar C about one notch. Lower collar B and turn collars B and C back one notch. Lower collar A to position. The holders are made from high-grade steel especially selected for the purpose, and are finished to close limits of accuracy.

### Dumore K-G Vari-Speed Flexible Shaft Tool

A flexible shaft outfit which will operate at speeds of from 1700 to 12,000 r.p.m. is now being marketed by the Dumore Company, Dept. 185-K, Racine, Wis. This equipment, to be known as the Dumore K-G Vari-Speed Flexible Shaft Tool, is especially intended for use in tool making, pattern making, and other work where small rotary files

**CLEAN Machinery is SAFE Machinery . .**

### The CLEMENTS —CADILLAC

**BLOWER — SUCTION CLEANER — SPRAYER**

Really **CLEANS** any motors or intricate machinery—thoroughly, safely. **DRIVES DRY AIR**, free from oil or moisture at great velocity but low pressure. **Removes** dust, lint, wood or metal particles—reducing risk of "shorts" and "burn-outs", cuts down fire hazard and excess wear. **Convertible** to sprayer or suction cleaner.

**CLEMENTS MFG. CO.,**

6655 South Narragansett  
CHICAGO, ILL.



Ask for **FREE Trial**

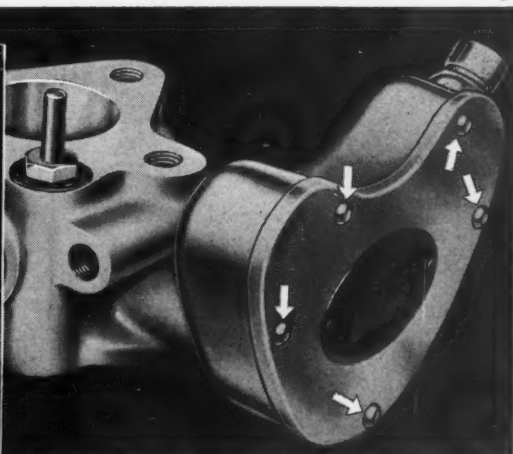
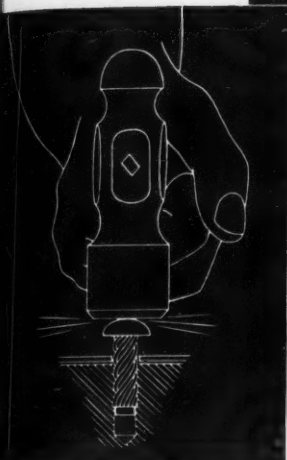


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*Make it Better... Make it Cheaper with Hardened Metallic Drive Screws*



A few hammer blows fasten the cover plate to the Handy Governor, a tamper-proof product of Handy Governor Corp., Detroit.

## Tamperers Foiled and 50% Saved

because "Handy Governor"  
read an Ad like this

An Ad similar to this introduced Hardened Metallic Drive Screws to the Handy Governor Corp. They didn't stop at reading it... they ACTED. They wrote for free samples... tried them for fastening cover plates to Governors... found that these Screws would make their product truly tamper-proof and do so with a 50 per cent reduction in assembly costs. Handy Governor writes—

By changing from the machine

screws to Hardened Metallic Drive Screws we eliminated tapping, and the need for a seal wire and cup. Also we found driving these Screws with a hammer to be a considerably faster operation than setting conventional screws with a screw driver. Cost records indicate a saving of fifty per cent over the previous method. Adoption of this modern permanent fastening also brought important additional tamper-proof qualities to our Governors. The Drive Screws foil unauthorized removal of the cover plate. As a result

of our success with these Screws we shall extend their use."

★

Do you make permanent fastenings to iron, brass and aluminum castings, steel or plastics? Would you like to have a fastening that holds more securely than machine screws, bolts and nuts, etc.? Are you seeking ways to cut assembly costs from 25 to 75 per cent? Then try Hardened Metallic Drive Screws. In seven cases out of ten a trial points the way to important benefits. Send a brief description of the fastening job for FREE samples and recommendations.

PARKER-KALON CORPORATION  
Dept. M, 198 Varick St., New York

## PARKER-KALON TYPE "U" HARDENED METALLIC DRIVE SCREWS

PATENTED No. 1,482,151-No. 1,512,222-No. 1,578,145-No. 1,578,329

TRY THESE, TOO



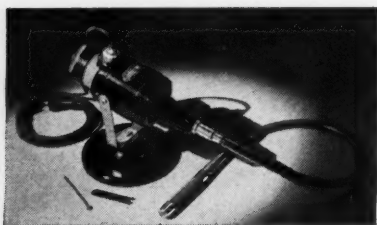
**Type "Z" Hardened Self-tapping Sheet Metal Screws**  
For joining and making fastenings to sheet metal up to six gauge; aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced, molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced.

**Hex Head Hardened Self-tapping Cap Screws**  
For making fastenings to sheet metal from 24 gauge to 10 gauge, and also to steel plates and structural shapes up to ½ inch thick, brass, bronze, die castings, plastics. They function like the Type "Z" Screws but are driven with a wrench.



Parker-Kalon Products are sold only through recognized distributors

grinding wheels, burrs, and cutters are used for finishing dies, patterns, and similar work to size. The use of this tool eliminates hand filing and polish-



Dumore K-G Vari-Speed Flexible Shaft Tool

ing, and makes it possible for the workman to work to close limits of accuracy and to produce work with a very much better finish than could be produced by hand.

Power is supplied by a  $\frac{1}{4}$  h.p. continuous duty Dumore Universal motor. The flexible shaft is 43 in. in length and the handpiece is of ball bearing construction. The chuck is of the collet type and has  $\frac{1}{4}$  in. capacity. The

flexibility of the shaft is such that it can be operated while bent in a U shape, permitting the operator to work in difficult places. A rubber covered flexible shaft is available if required in place of the steel covered shaft shown in the illustration.

One of the outstanding features of the Vari-Speed Flexible Shaft Tool is its governor control. With a twist of the wrist a speed range of from 100 up to 12,000 r.p.m. can be obtained, and at all times the tool delivers its complete  $\frac{1}{4}$  h.p. Thus mounted wheels are driven at the correct peripheral speed for grinding, while rotary wheels or cutters can be operated at the most productive speed for either hard or soft metals. The tool comes complete with a ball for hanging from a trolley hook. An 8-in. base can be furnished, however, if required.

### Ziegler Roller Drive Floating Tool Holder

The W. M. Ziegler Tool Company, 261 Smith Ave., Detroit, Mich., has originated a roller drive with ball bearing and thrust floating tool holder which automatically compensates for machine spindle misalignment and makes pos-



STEEL STAMPING DIE

## STEEL STAMPS ENGRAVED DIES

For Hand & Machine Operation

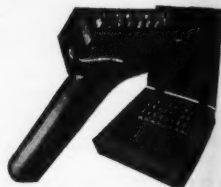
Builders of

## HI-DUTY MARKING MACHINES

For Every Marking Requirement Since 1895



ENGRAVED ROLL DIE



HAND TYPE HOLDER

## GEO. T. SCHMIDT, INC.

1806 BELLE PLAINE AV.

Send for Catalog

CHICAGO, ILL.

*New*

**VAN DORN**  
**1/2 INCH**  
**JUNIOR**

**\$35**

**A Quality Drill in the Low-Price Field**

MAN, here's the drill you've been waiting for—a powerful drill at a popular price. Drives twist drills for drilling up to  $\frac{1}{2}$ " holes in steel; augers for drilling up to  $1\frac{1}{4}$ " holes in wood. Also drives hole saws for cutting clean, round holes, from  $\frac{3}{4}$ " to  $3\frac{1}{2}$ " diameter, in wood, metal or composition. A husky, he-man tool that will make quick work of many tough

jobs. Smoothly designed. Perfectly balanced. Powerful Universal motor. All-purpose spindle speed. Triple gear reduction for plenty of torque. *Compo* oil-less bearings. Safety switch. Three-jaw key chuck. Real Van Dorn quality. And only \$35.00. See it at your jobber's—and write for our new catalog. Van Dorn Electric Tool Co., Towson, Md.

FOR POWER SPECIFY *"Van Dorn"* PORTABLE ELECTRIC TOOLS

sible the production of uniform, true and accurately reamed and tapped holes. Uniform reproduction of tool sizes and tool contours are assured.

Six standard sizes of holders are made, with capacities up to 6-in. diameter in types to fit hand and automatic screw machines and multiple spindle machines and heads, Garvin tapers, and drilling and tapping machines of all makes. Shanks furnished as standard are either straight or Morse taper. Special shanks can be furnished, however, to fit all tapping and reaming machines. Special floating holder designs will be supplied to meet all tapping and reaming problems. The tool is made of selected steels, and all parts are interchangeable, hardened and ground. Stock sizes will be sent on 30 days trial.



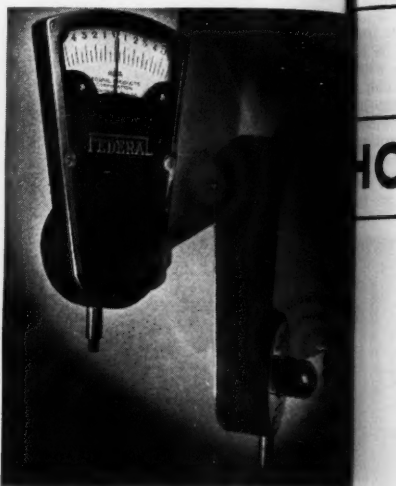
Ziegler Roller  
Drive Floating  
Tool Holder

### Federal Model 95 Clear Vision Indicator

The Model 95 Clear Vision Indicator—a new addition to the line of precision indicators made by Federal Products Corporation, Providence, Rhode Island—is said to clearly indicate variations of 1/10,000 in., and even finer divisions can easily be determined by the observer. A division of 1/10,000 in. is approximately 1/10 of an inch wide on the dial.

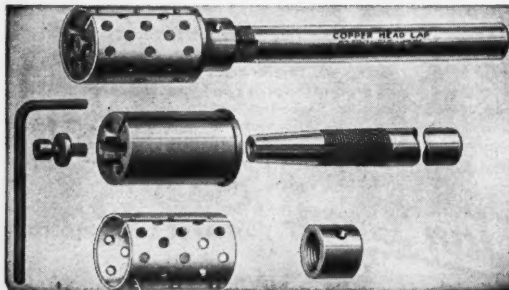
The Model 95 Indicator is mounted on a positive support. It is of streamlined design for appearance, but is pro-

portioned for rigidity. The instrument is simple both in construction and operation, providing features of accuracy and dependability which insure a good deal of satisfaction to the user of the instrument. A very fine adjustment of the anvil is obtained by a large knurled ring which, due to its relative diameter to the 24 pitch thread, permits a delicate control of the space between the contact point and the anvil.



Federal Model 95 Clear Vision Indicator

The maximum capacity of the instrument is 5 in. and the depth from point to rack is 3 in. The working surface of the anvil is 3 3/16 x 1 1/4 in. The base from front to back, is 10 1/4 in. and the height of the column is 13 in. The anvil is hand lapped, and the point is diamond tipped. The weight of the instrument is 34 pounds.



### LOWER YOUR LAPPING COSTS

with Groetchen Copper Head Expansion Laps. Profitably used in hundreds of leading shops. Available in sizes from 1/8" to 2 1/2", graduated by sixteenths of an inch. Many other designs for special applications.

Write for Bulletin C-40  
**GROETCHEN TOOL & MFG. CO.**  
124 N. UNION ST., CHICAGO, ILL.

# THE VALUE OF A TOOL

*Depends on*

# WHAT IT WILL PRODUCE

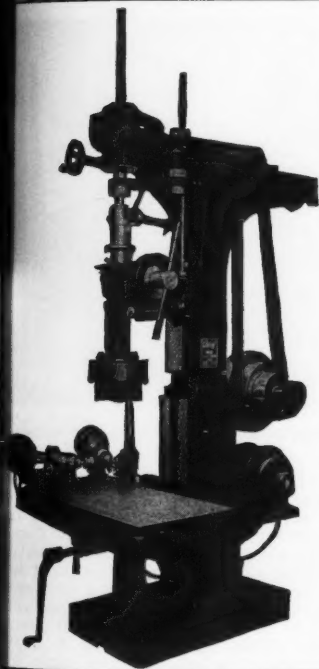
The Cost of Finished Work is the  
real consideration

## HOW GOOD--HOW FAST

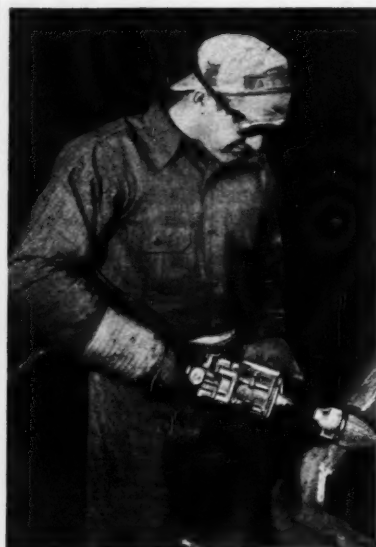
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Ask *Avey*

We have  
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THE AVEY DRILLING MACHINE CO.  
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## A Real "IN and OUT" CONE GRINDER

for

Grinding Radii or Webs. Reaching into Castings. All forms of extension or internal grinding.



**D-0-1**

8 1/4 lbs., 10,000 R.P.M. for  
2 3/4 x 3 1/2 cone.

Try the D-0-1 in your shop for 10 days at our expense. You'll wonder how you ever got along without it.

## The Rotor Air Tool Co.

5600 Carnegie Ave., Cleveland, O.

European Representative

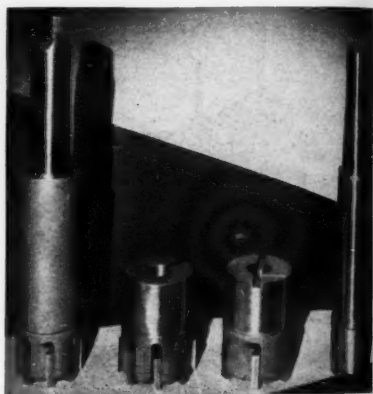
GASTON E. MARBAIX, LTD.

Vincent House, London

## Ingersoll Zee Lock Core Drills and Reamers

The line of Zee Lock Tools made by the Ingersoll Milling Machine Co., Rockford, Ill., has been augmented by the addition of the Zee Lock Core Drills and Reamers shown in the illustration. The application of the Ingersoll Zee Lock Cutter Blade to multi-blade boring tools makes possible a drill or reamer with an adjustable and renewable inserted blade. The cutters may be re-ground to size by moving the Zee Lock Cutter Blade to the next slot in sequence in the cutter body, by which process the blade is moved out only a part of a serration and thus the amount of regrinding required is minimized. From 8 to 36 adjustments or resizings are possible with one set of blades.

Ingersoll Zee Lock Core Drills are made either with a shank or of the



Ingersoll Zee Lock Core Drills and Reamers

shell type for use on a separate arbor. The coarsely spaced blades in the core drills are set with rake and shear for free cutting. Ingersoll Zee Lock Reamers are also made in either shank or shell type as shown, with the exception that the reamer is equipped with more blades, which are set straight or with negative shear angle and irregularly spaced. Other special boring tools are made with special piloting body designs or in combination with other boring, facing, and hollow milling tools.

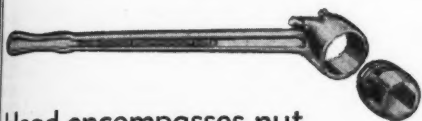
The housings or bodies of the boring tools are of forged and heat treated alloy steel, and the Ingersoll Zee Lock Cutter Blades can be furnished either



Drills

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# NUT TURNING SPEEDED UP . . .



WITH THE  
**FAVORITE**  
*Reversible  
Ratchet*  
**WRENCH**

Head encompasses nut on all sides. No slipping. No damage to nut. No quarter turn and a fresh hold, as with the old-fashioned open-end wrench.

## A TIME-SAVER

Repair Work Made Easy

Send for Full Particulars

**Greene, Tweed & Co.**

Sole Manufacturers

109 Duane Street  
New York, N. Y.



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**STANDARD  
DRILL BUSHINGS**

**COLLET CHUCKS  
for End Mills**

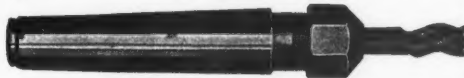


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**LOW  
COST**

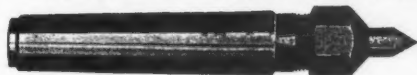
**UNIVERSAL  
ENGINEERING CO.**  
FRANKENMUTH, MICHIGAN



**KEYWAY CUTTERS**



**AND  
NITRIDED CENTER POINTS**



of special selected forged high speed steel, super cobalt high speed steel, Stellite, or tipped with cemented carbide. The construction provides an economical tool both as to initial cost and as regards replacements of blades.

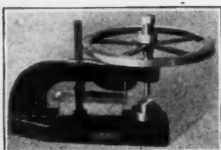
### Ross Straightway Solenoid Controlled Valves

The introduction of Ross Solenoid Controlled Three and Four Way Operating Valves, made by Ross Operating Valve Company, 6488 Epworth Blvd., Detroit, Mich., has developed a demand

for a similarly constructed straightway open and shut valve. This demand has increased to such an extent that these valves are now being manufactured in standard products.

The Straightway Solenoid Controlled Open and Shut Valves are applicable to all operations where straightway solenoid valves are used, but are intended primarily for industrial use where service is unusually severe. The valve is furnished in two styles, normally closed or normally open. Each unit included a metal dust cover, and all connections to the valve and solenoid are through the base. Piping is installed permanently to the base, and either the valve or solenoid can be re-

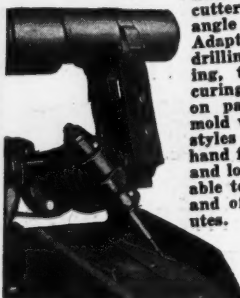
### The Light Wave Micrometer



A Super accurate, time saving, bench micrometer for shop departments and laboratories at low cost.

Write Today for Catalog 29  
**THE VAN KEUREN CO.**  
Watertown, Mass.

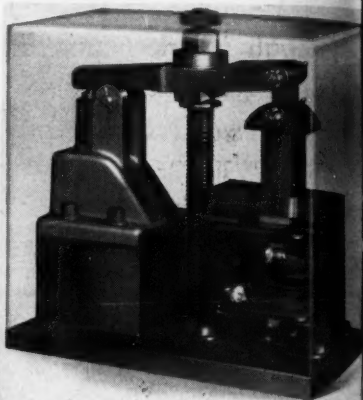
### ANY MILLER + Porter-Cable Universal Milling Machine Head = Universal Milling Machine



Simplifies set-ups, saves hand work on awkward jobs because cutter operates in any angle in any plane. Adaptable for boring, drilling, broad milling, tee slotting, securing proper draft on patterns, die and mold work, etc. Seven styles for power and hand feed millers, high and low speed. Adaptable to any miller, on and off in three minutes.

Fifteen days trial.  
Ask about it.

**PORTER-CABLE MACHINE CO.**  
Metal Div. No. 3, Syracuse, N. Y.



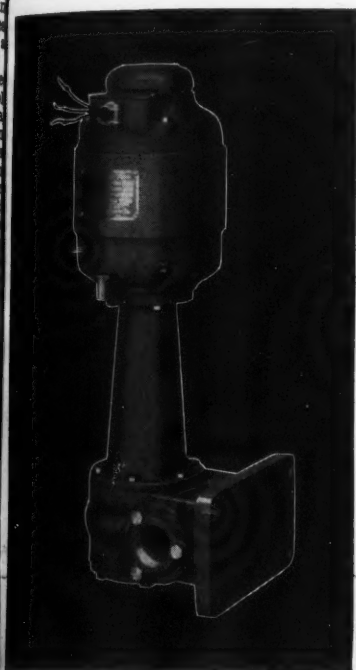
Ross Straightway Solenoid Controlled Valve

moved without disturbing the remainder of the unit. The valve will be furnished for either A.C. or D.C. in all standard voltages for pipe sizes ranging from 1/2 in. to 1 1/4 inch.

### Lincoln 200-Amp. Shield Arc Special Welder

A 200-ampere special engine-driven "Shield Arc" welder is announced by The Lincoln Electric Company, Cleveland, Ohio. This new model, known as the "200-ampere Shield Arc Special," supplies a uniform current for welding with bare or heavily coated shielded arc type electrodes in all sizes up to 1/4-in. The welding current range of the machine is from 60 to 250-amperes. The generator is the single operator variable voltage type with completely laminated

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## GUSHER COOLANT PUMP

**... Simplicity** is the secret of Ruthman Pumps' reputation for trouble-free and dependable service. They have a minimum of working parts, no metal to metal contacts and minimized friction. Packing nuts are eliminated, and priming never required. Result—fewer parts to wear out—fewer opportunities for trouble. We'll be glad of the opportunity to submit suggestions or dimension prints, without obligation.

**THE RUTHMAN MACHINERY COMPANY**

530 E. FRONT ST. CINCINNATI, O.

## LOCALIZE YOUR LIGHTING

FOR FASTER PRODUCTION...  
LESS WASTE... GREATER SAFETY

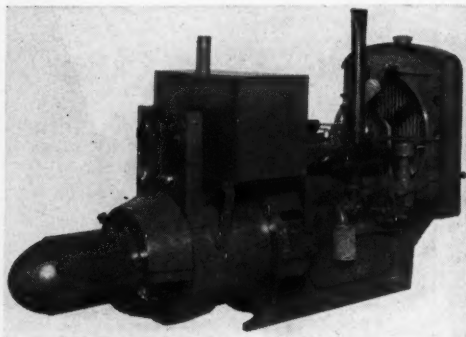
The need for high intensity over-all illumination is reduced by the Fostoria Machine Lamp. Intense, uniform light—50 foot candles or more—is focused directly, as easily as pointing your finger, at the points where light is needed. Faster production, less spoilage, greater safety naturally result... An analysis of your particular lighting needs will be made gladly on request without obligation.

The Fostoria Pressed  
Steel Corporation  
Industrial Div.  
Fostoria, Ohio



magnetic circuit and equipped with interpoles.

No external reactance or stabilizer is required. The patented Lincoln dual



Lincoln "Shield Arc" Welder. 200 amp. special engine driven type.

control of welding current is provided by adjustment of both series and shunt fields. Separate excitation of the generator shunt fields is supplied by an exciter connected on the generator end of

the unit. A generator field rheostat and a current regulating switch are mounted in vertical position on a "dead-front" steel control panel. Electrode and ground cable connections of the wing type are also in an easily accessible position.

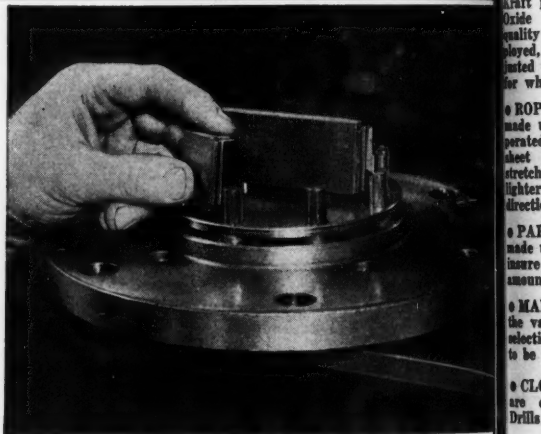
The welder is powered by a Waukesha 4-cylinder engine which delivers 23 h.p. at 1400 r.p.m. the speed at which the welder is operated. A gear driven governor maintains proper engine speed at all load conditions. The engine is equipped with standard high tension magneto and vertical type carburetor with air cleaner. A gasoline tank of ample capacity for a full day's operation is mounted over the generator. The engine is direct connected to the generator shaft. Due to this close coupling feature, the unit is compact and weighs only 1078 pounds.

### Shaw-Box Type "WR" Hand Operated Hoist

The Shaw-Box Crane & Hoist Company, Inc., Muskegon, Mich., has developed the hand operated trolley hoist

## modern toolroom inspection

*calls for greater accuracy—faster methods. You provide both by using*



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GAGING BLOCKS AND ACCESSORIES

Prices of these Gaging System Sets start as low as \$175.  
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neostat; mounted on the head-frame and ground wing mechanism. The hoist was designed primarily for use as a hoisting unit on the Shaw-Box Single Girder cranes, but it is available for use on overhead I-beam monorail systems. The nature of the hoist consists in that it is designed to operate where headroom is limited, providing an exceptionally high hook lift. On a two-ton capacity hoist, the hook in its highest position is only 9% in. below the track on which it operates. This dimension is less on smaller capacity hoists. The hoist is built in capacities of 1/2, 1 and 2 tons. The frame of the hoist is built up entirely of steel members arc welded together to form a rigid, one-piece unit. All boring and milling operations are performed after assembly, assuring accurate and permanent alignment. The trolley is built integral with the hoist frame and is equipped with single flanged wheels which rotate on radial thrust ball bearings. The operating mechanism operates in oil and on ball bearings throughout. One man with this hoist can handle capacity loads with ease. The load is raised or lowered by pulling on an endless hand chain which drives the winding drum through a self-locking worm gear reduction unit. The hoisting is accomplished through

No. 6 of the Series

## WHAT ARE THE VARIOUS COATED ABRASIVES?

WHAT ARE THEIR USES?

### BACKINGS

By E. B. GALLAHER

Editor, Clover Business Service  
Treasurer, Clover Mfg. Co.

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**A** PREVIOUS AD described the making and uses of Abrasive Belts . . . today we tell you about the various backings employed in the Coated Abrasives industry. Generally speaking, all backings are of paper, of cloth, or of a combination of paper and cloth.

• **ALL FLINT SHEETS** are made up on Kraft paper, while with Garnet, Aluminous Oxide and Silicon Carbide coatings, high-quality wood-pulp or rope papers are employed, the weights of the paper being adjusted to the size of the grit or special work for which it is intended.

• **ROPE PAPER**, for belts and roll goods, is made up with the fine fibers of rope incorporated, which run lengthwise, so that the sheet has great strength and very little stretch in ONE direction. Kraft paper is lighter and has no special strength in any direction.

• **PAPER BELTS**, generally speaking, are made up on rope paper backings . . . this to insure maximum strength and a minimum amount of stretch.

• **MANUFACTURERS' LISTINGS** specify the various backings employed . . . careful selection of backing for the kind of work to be done is essential.

• **CLOTH BACKINGS.** Two kinds of cloth are employed—Jeans ("J" backing) and Drills ("X" backing).

• **JEANS** are light and flexible. They are employed almost exclusively for sheet goods, though special belts are sometimes made of them where extreme flexibility is more necessary than volume of production.

• **DRILLS** are especially woven for Coated Abrasives, having more threads in the length than in the width. This assures greater strength and a minimum of stretch. Drills

are much heavier than Jeans, and are employed in making abrasive belts, also for roll goods.

• **CLOTH SHEETS** are made on both "J" backing and "X" backing, depending on the size of the grit used, to insure flexibility in the fine grits and supply necessary strength for the coarse grits.

• **COMBINATION BACKING.** This is made by gluing together rope paper and a light cloth. The combination produces a backing which is stronger than rope paper alone, but not as strong as an "X" backing.

Combination-backed material is employed on work requiring greater strength than found in rope-paper belts, but which does not require the strength found in belts made of "X" backing materials, though it lacks some of the work value of the latter.

• **NOTE:** Your success in the use of Coated Abrasive materials will depend quite as much on the kind and size of grits employed. This requires special knowledge, which we are always glad to supply.

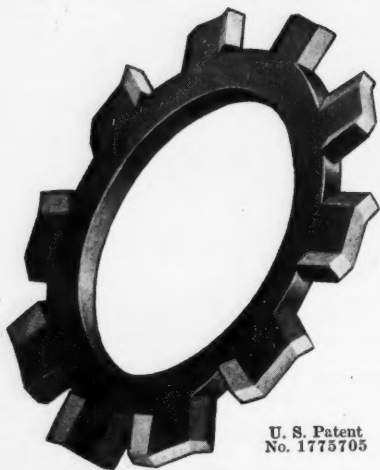
• File these ads for reference.

**CLOVER MFG. CO.,** NORWALK, CONN.

Also Makers of the Famous  
CLOVER GRINDING AND LAPPING  
COMPOUNDS

*Gallagher*

## Here Are the Reasons Alert Engineers Are Specifying Everlock Washers



U. S. Patent  
No. 1775705

**1. POSITIVE LOCKING**—The sharp projecting edges of EVERLOCK teeth bite into the nut and the work. Vibration cannot jar them loose.

**2. POWERFUL SPRING TENSION** — When a nut is set down on an EVERLOCK Washer a powerful spring tension is set up in each tooth, which prevents rattling and vibration between parts.

**3. TESTS**—Their own tests have proved to engineers the positive locking and powerful spring tension afforded by EVERLOCKS. You can easily test them on your own work. Free samples mailed on request.



### Thompson-Bremer & Co.

1640-E W. Austin Ave., Chicago

the medium of a steel cable and drum similar to that of large capacity cranes. This design eliminates the pocket wheel and chain as well as the tail chain which oftentimes becomes entangled with the load. The self-locking worm gear reduction unit performs the same function as a mechanical load brake—holding the load in any position during raising or lowering.



Shaw-Box Type "WR" Hand Operated Hoist

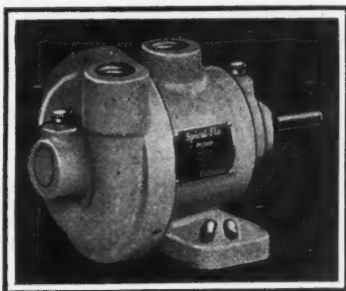
ing or lowering and preventing the load from raising or lowering too fast. The load is delicately controlled permitting smooth, accurate spotting.

### Diehl Clearance Type Electric Grinder

Long parts or pieces of material can be ground on the Diehl Clearance Type Electric Grinder, which has been placed on the market by the Diehl Manufacturing Company, Elizabethport, N. J. The grinder is designed, as shown in the illustration, with a flat face on the front side of the motor housing, permitting the periphery of the grinding wheels to extend considerably beyond the limit of the housing.

The grinder is furnished with two high quality grinding wheels, 6x4, one of coarse grain and the other





# Spiral-Flo PUMP...

Designed to pump water or oil or any combination of the two. Operation is not affected by grit or chips. These pumps are available directly connected to bell type mounting motors.

*Write for Bulletin No. 4*

2 1/2-52 G.P.M.

**THE TOMKINS-JOHNSON COMPANY**  
620 N. MECHANIC STREET, JACKSON, MICHIGAN

*"The Blade in the Plaid Box"*

**DON'T PUT OFF  
ENJOYING**

the economies in labor and materials, the improvements in quality and efficiency that using

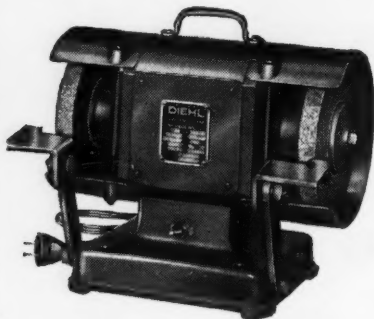
**LENOX HACK SAW  
BLADES**

can give you.  
Try them now and you'll use them always.



**LENOX**  
HACK SAWS  
BAND SAWS

Adjustable steel tool rests compensate for wheel wear and heavy steel guards afford maximum protection. The motor is rated  $\frac{1}{4}$  h.p., 3450 r.p.m. for 110 volt,



Diehl Clearance Type Electric Grinder

60 or 50 cycle alternating current operation, and is totally enclosed. It is equipped with dust sealed ball bearings, convenient starting and stopping switch and 6-ft. rubber covered cord and plug.

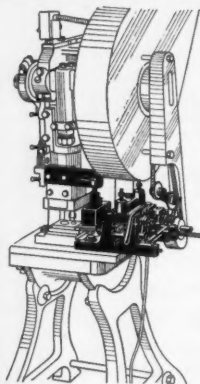
The grinder is easily portable and is provided with a rugged cast iron base

which eliminates the need for fastening to bench or table. Rubber insulating feet minimize the noise and vibration of grinding. The grinder is  $10\frac{1}{2}$  in. high,  $12\frac{1}{2}$  in. long, and  $8\frac{1}{2}$  in. wide. Approximate net weight is 38 lbs. The entire unit is attractively finished in machine tool blue with nickel plated fittings.

Shaft attachments for drilling, sanding, and buffing which greatly increase the usefulness of the grinder can be supplied upon request. The attachments include a work arbor with drill chuck upon which can be mounted a sanding disc, cotton buffing wheel or wire scratch wheel. The drill chuck is of the three-jaw type and takes drill up to  $\frac{1}{4}$ -in. diameter. The sanding drill is furnished with coarse and medium grip belt.

### Bridgeport High Speed Milling, Drilling and Boring Attachment

The Bridgeport Pattern and Model works, 52 Remer St., Bridgeport, Conn. has brought out the High Speed Milling Drilling and Boring Attachment shown in the illustration. The attachment is



## WITTEK ROLL FEEDS for Punch Presses

**FAST \* Accurate \* Automatic \* Safe**

Step up your press production three to ten fold. Save dies and reduce scrap.

Wittek Roll feeds will feed 0" to 24" or more per stroke of the press. Made in Single Roll—Double Roll and compound with straightener for all feeding conditions.

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Automatic self-centering, plain or Ball Bearing, also made in disk type for small coils. Adjustable in height and to any angle. Will hold coils up to 500 pounds.

Prompt deliveries from stock.

**Wittek Mfg. Co.** 4308 West 24th Place  
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**THE SEMI-PLASTIC  
METALLIC PACKING**

## A UNIVERSAL PACKING

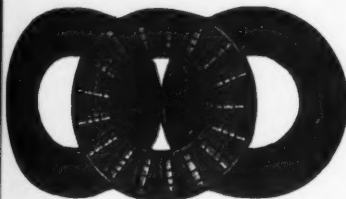
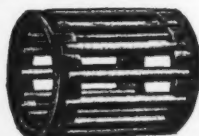
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Used on all kinds of pumps and wherever a good Packing of its type can be used. It is popular in laundries, creameries, breweries, ship yards, refineries, in automobiles, on elevators, etc.

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**Red Devil Products Co.**

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ROLLER THRUST BEARINGS  
JOURNAL ROLLER BEARINGS**

Special Bearings Made to Order.

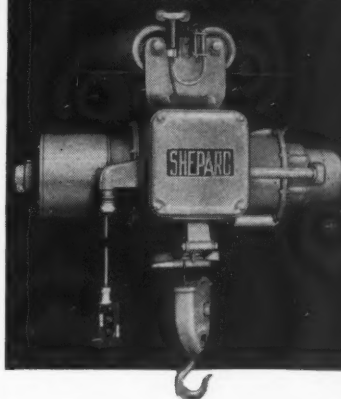
Send Sketch or Sample for Quotation.

*Catalog Upon Request*

**THE GWILLIAM CO.**

358 Furman St., Brooklyn, N. Y.

# SHEPARD



**ELECTRIC HOISTS**

*Exclusive features:* 1. Balanced Drive, at two points diametrically opposite. 2. Perfect alignment, maintained by all parts rotating around a common axis. 3. Automatic Oil Bath Lubrication. 4. Control by rope, push button, outrig or controller for every hoist. 5. Precision variable speed control for both A. C. and D. C. 6. Variety of speeds, types, lifts and capacities precisely suited to any service. *Write for complete data.*

**SHEPARD NILES  
CRANE & HOIST CORP.**

424 South Schuyler Avenue  
Montour Falls New York

**IT'S THE  
HEAVY COATING  
THAT MAKES  
WELDING WITH W-20  
EASY**



**WHEN** you want to weld mild steel in difficult positions and locations, and want an electrode that will do a high-class job fast and economically, try using Type W-20. You'll find that the heavy flux coating on this rod (1) promotes a fast and smooth flow of molten metal; (2) improves arc stability; and (3) purifies the weld metal so as to give a good-looking, uniform weld that has properties of ductility and tensile strength as good as those of the parent metal.

Drop in and see the nearest G-E welding distributor. He'll be glad to show you the electrode that will best meet your needs. General Electric Company, Schenectady, New York.

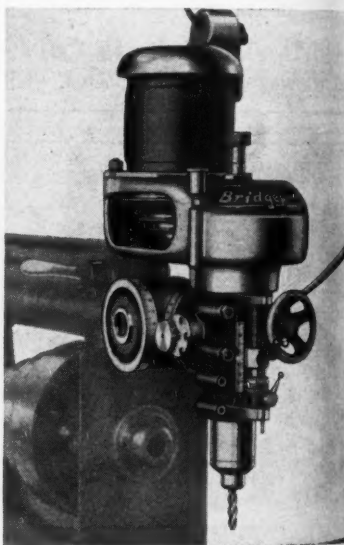
150-45

**GENERAL  ELECTRIC**

adaptable to all types of milling machines. It is shown mounted on the front face of a standard dual adapter, the utmost rigidity being provided when used in this position. When compound angles are desired, the side mounting is used.

The attachment was developed chiefly for die sinking and for jig, fixture and general tool room use. One of the chief advantages of the tool consists in the fact that milling, drilling, and boring operations can be performed at all angles without changing the set up of the work. The spindle speed range of 275, 425, 700, 1050, 2100, and 4250 r.p.m. gives the attachment a wide range.

The spindle is heat treated and ground and is machined to take a No. 2 Morse taper. The quill is treated with a special chromium process giving it a surface hardness one point below the hardness of a diamond. The housing is lapped and fitted to the quill. The quill has  $3\frac{1}{2}$  in. travel and is equipped with



**Bridgeport High Speed Milling, Drilling and Boring Attachment**

a positive lock. The micrometer depth stop is graduated in thousandths. Back and worm feed is supplied for drilling and boring. The attachment is driven by a  $1\frac{1}{3}$  h.p. 1150 r.p.m. ball bearing motor which supplies power to the

November, 1932

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## LAPPED & POLISHED DIAMOND BORING and TURNING TOOLS



"V" Point



Offset

● For boring and turning all non-ferrous metals, bakelite, hard rubber, etc. Strong and keen cutting. Guaranteed to perform satisfactorily.

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WHEEL TRUEING TOOL CO., Inc.  
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## MENDES QUALITY DIAMONDS *Always Sharp*



REDUCE FOLDER  
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Mendes Cutting Factories, Inc.  
DIAMONDS AND DIAMOND TOOLS  
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Pittsburgh, Baltimore



## There ARE Reasons for IXL Gear Superiority

### REASON No. 1

Unvarying dependability and accurate performance are assured in IXL gears, speed reducers and powered gears by the unsurpassed facilities for precision manufacturing, the rigid standards of inspection (one operation pictured at right) and the 75 years of experience in solving gear problems. Insist on the IXL mark on your gears. Write for the big IXL hand-book.

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IXL-5315 S. Western Ave., Chicago, Ill.

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| <input type="checkbox"/> Friction Clutches  | <input type="checkbox"/> Powered Gears                |
| <input type="checkbox"/> Flexible Couplings | <input type="checkbox"/> Special Machy. Stoker Drives |

Name.....  
Address.....  
Company.....

spline spindle through a pulley mounted on separate ball bearings.

### Landis Work Aligning and Indexing Fixture

The Landis Machine Company, Waynesboro, Pa., has developed a rather interesting and novel fixture for application to its Landmaco Threading Ma-

chines, for threading parts which have a thread on each end and require alignment and concentricity of both threads. In addition to providing alignment the fixture also indexes automatically so that both ends can be threaded with one gripping. While the application shown in the illustration herewith was used for threading auto-



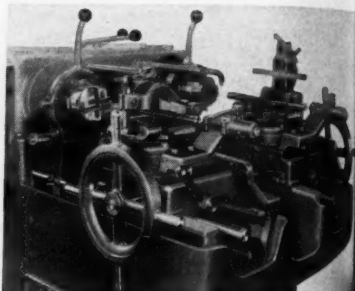
**Wrigraph**  
PRECISION  
DRAFTING MACHINE

**Guaranteed Accuracy  
Solid Bronze Bearings**

A product that has become world famous in just three years.  
**Write for Free Trial Offer**

*Write for literature and prices on Larger Models*

**L. C. WRIGHT, INC.**  
2715-16 EUCLID AVE. CLEVELAND, OHIO



Landis Work-Aligning and Indexing Fixture

**OSGOOD'S**  
**BALANCED-GRIP**  
**FILE AND TOOL**  
**HANDLES**

are used where comfort, durability and economy count.



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**J. L. OSGOOD**  
**HANDLE COMPANY**  
43 Pearl St. Buffalo, N. Y.

mobile tie rods it can be adapted readily to other work of a similar nature.

In the application shown the parts were made of steel forgings approximately 15 in. in length, threaded at each end to a length of 1 3/4 in. The fixture provides for maintaining concentricity of the pitch diameters of both threads and with the center line of the work within 0.005 inch.

The forgings are centered and the end faces to be threaded turned and ground previous to the threading operation. A ground "Vee" block at the front of the work holding fixture serves to properly locate and center the front end of the forging. Alignment of the rear end is obtained by means of a manually operated dead center, which is under spring

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—AT ANY ANGLE—  
—ACCURATELY GRADUATED—  
(With Hardened and Ground Jaws.....\$9.00)

**HEAVY DUTY SIZES UP TO 8"**

**ONLY \$7.50**

No. 0  
WIDTHS 2 1/2"  
OPENS 8"  
DEPTH 1 7/8"  
LENGTH 4"  
WEIGHT 10 LB.



**Chicago Tool & Engineering Co.**  
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D.

# **Standardized JIG BUSHINGS** Acme Standard over 6700 items A.S.A. Standard over 4200 items

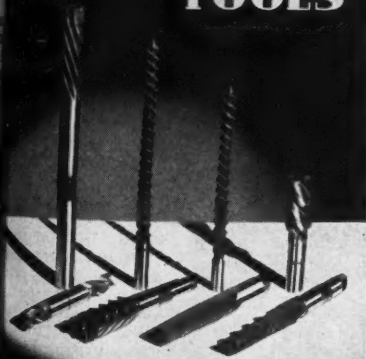
Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

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## **SPIRAL SPECIALISTS**

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# **A CLEAN BLOW WITH NO DAMAGE TO FINISHED SURFACES**

## USE THE **BASA HAMMER**



*Made in  
Five  
Sizes.*

Rawhide, Copper and Babbitt Faces can be inserted in head by simply loosening nut.

Faster and more satisfactory work made possible by the use of the "Basa" Hammer.

There are many assembly and finishing processes that demand the use of a hammer that can strike a light or heavy blow without damage to surface struck.

*All Faces  
Made in  
U. S. A.*



*Send for Particulars*

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Sole Manufacturers

109 DUANE ST., NEW YORK, N. Y.

pressure and which moves out of the way when the forging is clamped in position.

With the work resting on a ground "Vee" block at the front end and the rear end aligned with a center, the operator drops a self-compensating clamp on the work to hold it in position. A compensating wedge on the base of the fixture, actuated by the clamping device, moves over under the pad forged integral with the bar, seating the bar firmly and thus maintaining the alignment established by the center.

Upon completion of the first thread the carriage is withdrawn by means of the hand wheel, the backward movement of the carriage automatically indexing the work holding fixture 180 degrees. A lock bolt automatically locks the fixture in position after each indexing. In this manner both ends of the work are threaded in one gripping.

The fixture can be removed and the Machine converted into a standard Landmaco Threading Machine by applying a standard carriage and vise.

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**DIAL INDICATORS**

Precision requires dependability. The fact that more FEDERAL instruments are sold than all other makes combined is one way of telling you how dependable they are.

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Detroit • Chicago • Muncie • Cleveland • New York

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### "Silverbond" Stainless Steel Bar Stock

Jessop Steel Company, Washington, Pa., has developed a composite stainless steel bar stock known as "Silverbond" for use in any application where the surface of the bar must have corrosion and temperature resistant properties.

The product is described as being a web-like structure in which low carbon inexpensive inner to the extent of approximately 40 per cent are mechanically held, as well as welded by pressure applied at high temperatures, so that there is no possibility whatsoever of separation of the component parts. The cladding can be varied from 10 per cent to 25 per cent depending upon the application.

Stock is made in rounds, flats, octagons, hexagons, sheets, strips and other shapes to meet special requirements. It is now being used in the manufacture of refrigerator trays and accessories, shaftings where machining is not required, and various



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A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

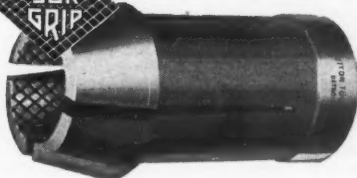
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**COLONIAL  
BUSHINGS, Inc.**

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## Sutton Sur-Grip Collets

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- Greater gripping power
- Less chucking strain
- Elimination of slippage
- Longer life and service

All types of SUR-GRIP Collets for different machines listed in Catalog No. 11. Send for your copy.

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The modern trend in machine design necessitates the use of Socket Head Screws—No protruding extra parts to mar the streamline appearance of your product. Now, with Fibro Forged Screws greater strength and better finish are added. Write Fibro Forged Screws in your specifications.

Patented by **HOLO-KROME**

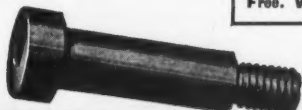
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Screws for a Test Sent  
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**FIBRO FORGED**



**SCREWS**



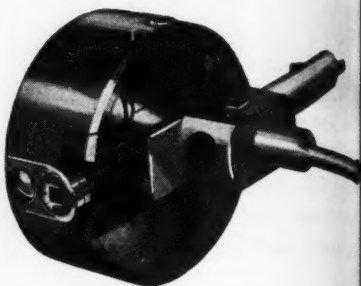
tectural and general decorative trim.

The insert of the less costly metal reduces the cost of the bar, and will, in some cases, be an advantage in forming and fabricating due to its added ductility.

### Flynn No. 35 Offset Boring Head

The Flynn Manufacturing Company, 437 Bates St., Detroit, Mich., has developed a boring head that is designed to perform facing as well as boring opera-

tions. The materials and workmanship are of the same high grade which characteristic of the other boring heads made by this firm. The design of the head is compact, the head being 4 1/2



Flynn No. 35 Offset Boring Head

2-in. with a small tool block extending 1 in. from the face.

The tool block is built to hold a boring bar or other tool of any size up to 3/4-in., either perpendicular or parallel to the face. This feature, combined with the 2-in. micrometer offset, gives this head all the advantages of a complete offset boring head.

### Numberall Quick Change Numbering Machine

A Quick Change Numbering Machine especially intended for consecutive numbering, illustrated herewith, has been placed on the market by Numberall Stamp & Tool Company, Huguenot Park, Staten Island, New York. Although automatic, the machine is so built that

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Collet or 3 Jaw  
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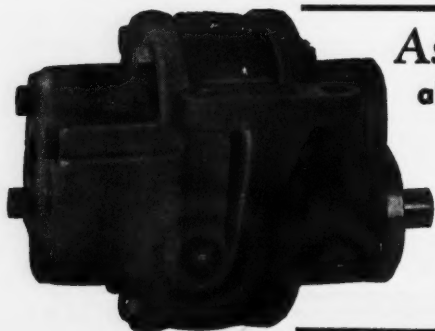
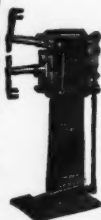
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Unassigned Dealer Territories  
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**Brown & Sharpe Mfg. Co.**

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# PUTNAM HI-SPEED END MILLS



Superior quality produced by methods accumulated thru many years of fine tool designing and manufacturing assure you of—  
**Maximum Production—Higher Speeds—Faster Feeds—Smoother Finish.**

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Models for Wall, Bench, Punch  
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## MICRO- ADJUSTABLE TRIP RING

**RICKERT  
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This outstanding improvement in collapsing taps makes the adjustment of the trip ring a matter of micrometer accuracy. Also, it saves valuable time, by eliminating old fashioned back-and-forth hammer blow trip ring adjustment.



Complete line Self-Opening Die Heads; Collapsible Taps, all styles—sizes; Accurate H. S. steel chasers; High Production Tapping Machines; Special Automatic Threading and Second Operation Machines (single, double spindle for threading spark plugs, etc.); Automatic Cutting-Off Machines; Nipples, Pipe and Bars.



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**ELECTRIC HAMMER AND DRILL**  
 Drills in concrete, masonry, metal and wood.  
 The drill you need for expansion bolts and  
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All types for dressing grinding  
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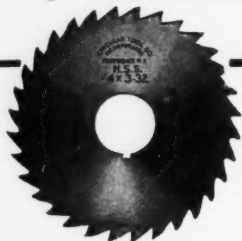
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Circle "R" products are made by an  
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consecutive number-  
 ing can be done at  
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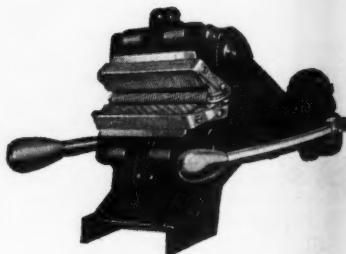
In consecutive  
 numbering, the last  
 digit has to be  
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 before the second  
 last has to be  
 changed once, and  
 the third digit only  
 every hundredth time.  
 Taking this fact into  
 consideration, this  
 machine has been de-  
 signed with the last  
 wheel integral with  
 the axle and attached  
 to an outside knob  
 by which it can be  
 turned. The entire  
 machine is built for  
 hard usage, and the  
 design of the shank  
 is such that it is  
 adaptable for hand or  
 hammer stamping, or  
 for use in a press.



**Numerall**  
**Quick Change**  
**Numbering**  
**Machine**

### "Safety" Portable Belt Lacer

The Safety Belt Lacer Company, To-  
 ledo, Ohio, announces a new Portable  
 Belt Lacer, illustrated. A notable and  
 exclusive feature of this Lacer is that  
 the jaws contact the hooks only; thus  
 in lacing a belt an even, firm pressure  
 is assured, each hook being imbedded  
 deeply, even with the surface of the belt  
 and with the identical amount of pres-  
 sure being applied to each hook. This



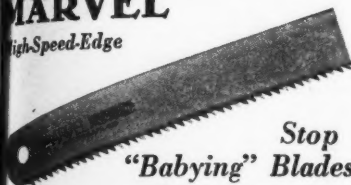
**"Safety" Portable Belt Lacer**

desirable result, it is claimed, is inter-  
 fered in the use of Safety hooks, because  
 Safety hooks, being exactly in line and



## MARVEL

High-Speed-Edge



### Stop "Babying" Blades

After one of your individual machine operators has used a good quality of MARVEL High-Speed-Edge Hack Saw blades continuously without interruption . . . without any "test" of other brands, that operator will have unconsciously learned to stop "babying" hack saw blades. He will have adjusted his machine to greater feeds (to do his work faster) and will have learned to apply greater tension to his blade (to do his work more accurately) than any other hack saw blade will stand; with the result that he will then break or shatter any other brand of blade you give him, either for regular use or for "test", until he again slows down his production by "babying" the blade.

Write for circular.

Armstrong-Blum Mfg. Co.

"The Hack Saw People"

15 N. Francisco Ave., U. S. A.



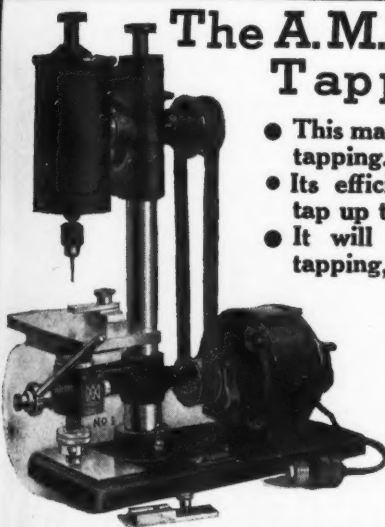
## CHAMPION POWER HACK-SAW STAND



This stand is advantageously used wherever power hack-saws are operated. It can also be used as a jack. Maximum adjustment is 6 in. Head can be swiveled. Base diameter is 14 in. Maximum height is 30 in. and weight is 80 lbs.

Write for prices

The Western Tool & Mfg. Co.  
Springfield, Ohio



A. M. TAPPING MACHINE

## The A.M. Super Sensitive Tapping Machine

- This machine registers 100% for delicate tapping.
- Its efficiency ranges from the smallest tap up to 3/16".
- It will handle through or bottoming tapping, either R. or L. hand.
- It is friction driven, no dogs, no gears, free from shock, no broken taps.
- It is clean to operate, noiseless, no experience necessary.

Our Tapping Machine Bulletin tells the story in full, ask for it.

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CINCINNATI, OHIO, U. S. A.  
Since 1882

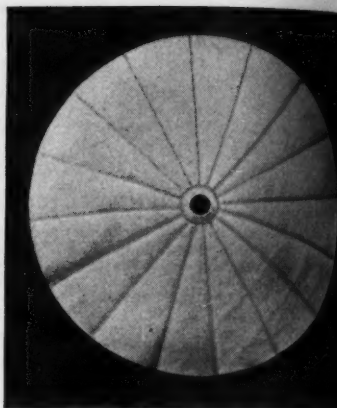
immovable on the steel binder bars, enter the belt with precision and evenness.

It is pointed out that the angle of the jaws of this new Lacer give perfect vision to the operator while lacing. More than ample power is provided to properly imbed the hooks. Due, according to the manufacturer, to the fact that the jaws contact the hooks only, many jobs that ordinarily it would be necessary to lace on a larger Lacer, in order to get sufficient flat pressure, may be laced on this portable lacer.

This machine laces up to 6 inches in one operation and the lacing may be started by using one handle only, leaving the other free to properly insert the belt and hold it in exact position.

### Udylite Humidified Buffs

The illustration shows one of the new line of Humidified Buffs which has been brought out by The Udylite Company, 1651 East Grand Boulevard, Detroit, Michigan. Acting upon the principle that cloth that is allowed to dry becomes weakened and that buffs of such cloth do not cut well, do not last, and increase buffing costs, this firm has developed a method of air conditioning the buffing wheels so as to impregnate each



Udylite Humidified Buff

wheel with the correct amount of moisture to give it the maximum of tensile strength and wear resistance. Each piece entering into the construction of the Udylite Humidified Buff is treated by this special humidifying process.

The Udylite Humidified Buff is an



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LINLEY NOISELESS ROTARY RIVETING MACHINES

Assure Peak Production and Lower Maintenance. Rigid and Powerful. Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

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And cheaply with **THREADWELL** Keyway Cutters, used in Arbor Presses. Small Keyways — Small Presses. Large Keyways — Large Presses, Hydraulic, or Motor Driven.

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Counterbores and Countersinks, Counterbore Sets, Spotfacers, Coredrills, Reamers, Hollow Mills, Full Floating Holders, Facing Heads, Form Cutters, Boring Bars, Boring Heads, Adjustable Extension Holders, Multi Diameter Tools.

Catalog on Request: Representatives in All Principal Cities.

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TROY ST.



## • NEW An Inexpensive ABRASIVE BAND GRINDER . . .

*"Built Like a Machine Tool"*

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout, equipped with **ALEMITE LUBRICATION**, complete with grease gun.

*Write for illustrated folder on this and other styles and sizes.*

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## The New Stackbin Section

Patented



## MAKES A STOCKROOM AS EASY TO BUILD AS A SECTIONAL BOOKCASE

The Stackbin Section is designed so that one section nests into the other, and sections nest deep enough so that several placed one on top of the other provide a substantial unit. Ideal for temporary stockrooms near the job. Base separate. Counter top can be supplied. Write for circular and prices.

**STACKBIN CORPORATION**

TROY ST.

PROVIDENCE, R. I.

## IN NEARLY A HUNDRED DIFFERENT WAYS



**Haskins Equipment**  
Cuts costs  
and Speeds  
Up Production.

*And additional uses are being discovered all the time.*

Light, portable, quickly moved wherever needed . . . as easy to use as a hand tool . . . permits the use of tools and grinding wheels in hard-to-get-at-places—THAT'S why Haskins flexible shaft equipment is cutting costs and increasing production in thousands of plants in every major metal working industry. It can do the same for you, too! Send for illustrated booklet showing many different adaptations and actual operation pictures. **R. G. Haskins Company, 4667 West Fulton Street, Chicago, Illinois.**

**Haskins**  
FLEXIBLE SHAFT EQUIPMENT  
*with Greater Adaptability*

## ACE SPOT WELDERS

1,200 WELDS PER HOUR  
Continuously on 24 Ga.  
Welds from 24 to 16 Ga.  
For production or general  
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**PRICE, ONLY \$47.50**

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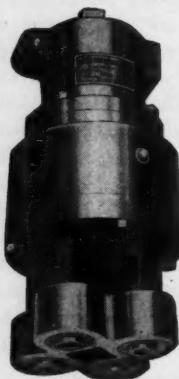
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- SINGLE LEVER CONTROL
- CONE HEAD AND GEARED HEAD
- 14" TO 30" SWING

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## More Holes per Minute



And a better  
profit for you  
that's the  
result of applying  
U. S. Multiple Units to  
your drilling machines.

By specializing  
in the design of  
special Drill  
Head Units, we  
can easily meet  
your requirements  
of accuracy and  
economy.

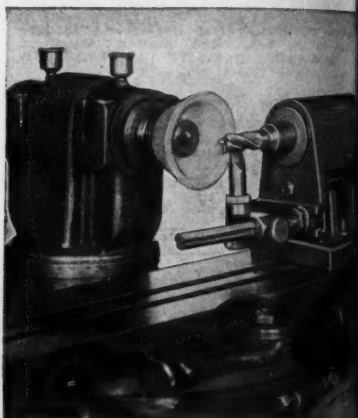
Send blue prints  
for estimates.

**The United States Drill Head Co.**  
1954 Riverside Drive  
CINCINNATI, OHIO

able in any type, any size, and any style of sewing; in other words, it can be furnished to the user's specifications. The buffs are packed and sealed in moisture proof paper so that they will arrive at the point of destination in proper condition for use.

## Weldon End Mill Sharpening Fixture

A new end-mill sharpening fixture stated to have important time-saving advantages as to set-up combined with unusual ease and simplicity of operation, is now being manufactured by The Weldon Tool Co., 321 Frankfort Avenue, Cleveland, Ohio. Originally designed for



Weldon Rocking Head End Mill Sharpening  
Fixture, with Guide Finger

use in the Company's own plant for the accurate production sharpening, the new fixture is also particularly well adapted to general reconditioning needs in the average machine shop.

It is adaptable to all types of the steep spiral end-mills as well as to slow spiral types, and will handle left or right hand spirals and cuts with equal facility.

No centers or lead cams are necessary. The principle used consists of a rocking head which permits an end-mill to be moved away from the wheel during grinding without changing the machine setting, and a guiding finger contacting the inner side of the flute in such a manner that it revolves the mill only when the cutter is rotated against the spiral. Since the guide finger itself



**DIEFENDORF**

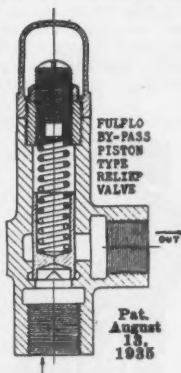
*... for all types of gears.*

When you want gears, you will save time and money by sending your inquiry to **DIEFENDORF** . . . . . Cutters of all types of gears . . . . . from all metals and other materials. Let us quote on your next requirement.

**DIEFENDORF GEAR CORPORATION**  
Syracuse, New York

## FULFLO Non-Chattering By Pass Piston Type Relief Valve

**T**HIS valve is made in pipe sizes from  $\frac{1}{2}$  to 3" and is suitable for pressures from 10 lbs. to 1,000 lbs. Adjustment can be made by removing cap and turning adjustment screw at top of valve. The cylindrical piston seat closes off the port in a shearing manner, and does not seat abruptly against the body of the valve, thereby, relieving a pounding or chattering noise as ordinarily caused by standard valves using a disc seat.



**Fulflo Specialties Co., Inc.**  
BLANCHESTER OHIO

## MIDWEST EXPANSION REAMERS

- Maximum strength and elasticity provided by high speed cutting end welded to tough alloy steel shank.
- Vital point of expansion located in alloy steel section.
- Ample high speed section for re-sharpening.



Listed on pages 28 and 29 of new Midwest No. 14-M Catalog. Send for your copy of this 64 page manual on modern cutting tools.

Made in standard sizes  $\frac{1}{2}$ " to 3", both straight and taper shank, also with G. M. taper shank for separate holders.



## Midwest Tool & Mfg. Co.

2360 WEST JEFFERSON AVE.

DETROIT, MICH.


mounted on the rocking member, there is no risk of its losing contact with the flute. As a result, only a single pass is needed for each flute in order to produce uniform and accurate back-off.

The fixture consists of a cast-iron base and the rocking head and finger, the latter being fully adjustable for all sizes of mills from  $\frac{1}{4}$ -in. to 2-in. flute diameter, straight shank type. Extra bushings can be supplied for handling taper shank mills if required. All spindles and sleeves are hardened and ground to

close tolerances, as are the extra bushings mentioned above.

### Seneca Falls Automatic Work Driver


Seneca Falls Machine Company, Seneca Falls, N. Y., has brought out a work driver which is designed to eliminate the time required to adjust, clamp and remove dogs from the work, thus providing more free time and making it possible for an operator to operate more



**SAVE  
THAT OLD  
GAUGE**



We renew model  
No. 55 for only  
**\$2.50**

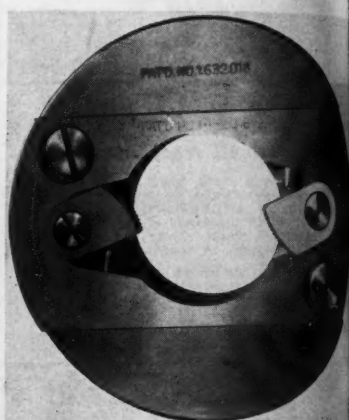
**B. C. AMES CO.**  
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**Greenard  
Arbor  
Presses**

Write for our Catalog  
36 showing 64 different  
styles

 **Greenard Arbor Presses**   
NASHUA, N. H.



Seneca Falls Automatic Work Driver

than one machine. The work driver is adaptable for all makes of turning and grinding machinery.

The construction of the driver is extremely simple. Eccentric driving pins are mounted on a guided slide which is free to adjust itself to any eccentricity

## Cullman Sprockets

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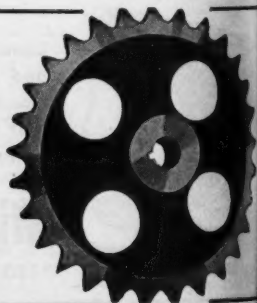
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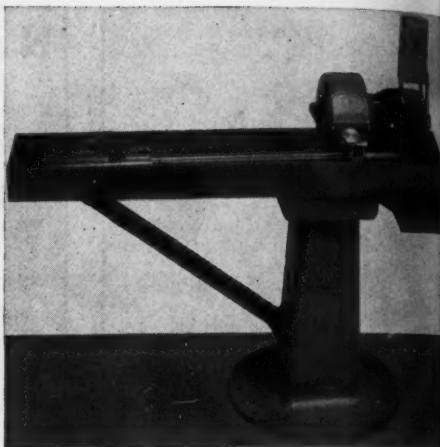
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between the center and the outside diameter of the work, thus balancing the gripping pressure of the jaws and eliminating all strain on the head-stock center. The slide is mounted on a guide way, giving it positive driving and eliminating chatter and resulting in longer tool life. Slippage of the work is practically impossible; the harder the pull, the tighter the grip.

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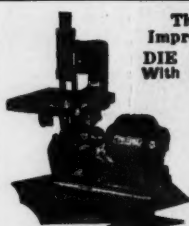
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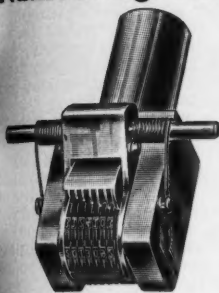
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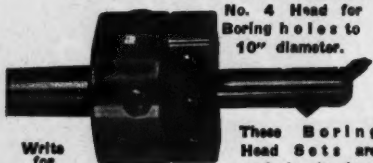
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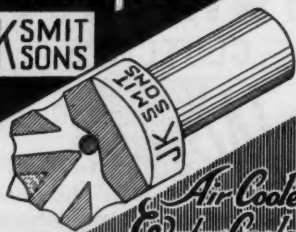
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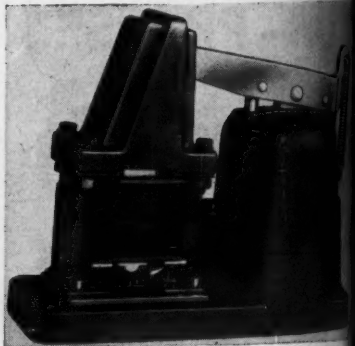
The cutting tool of this machine consists of a thin abrasive wheel driven by a  $\frac{3}{4}$  h.p. motor at a speed of 5,500 surface feet a minute. The wheel revolves within a cooling tank partially filled with water above the cutting level. An adjustable stop is furnished for accurately determining the current cutting length. A quick acting clamp and long trough facilitate holding and handling the material.

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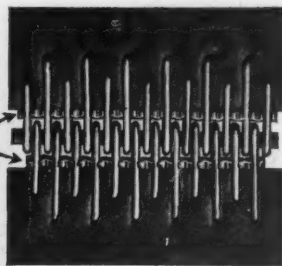
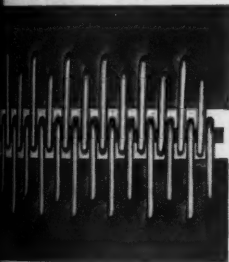
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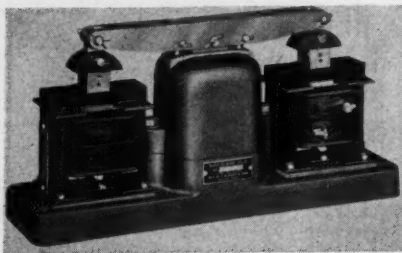
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sealing "U" packings, enables the valve assembly to supply 3-way regular action for single acting cylinders and also 4-way regular action for the control of double acting cylinders.

Assemblies are furnished in both 3-way and 4-way action for pressures up to



Hunt Double Solenoid Valve Unit

100 lbs. and up to 200 lbs. respectively. G. E. Solenoids No. 211-E and No. 206-A are used as standard units in the assemblies, built in sizes for standard  $\frac{3}{8}$ -in.,  $\frac{1}{2}$ -in., and  $\frac{3}{4}$ -in. pipe. The valve is also available in 2-way action, on and off, no exhaust. The valve cage of the solenoid assembly is gasketed to the bed

plate, to which pipe lines are attached, enabling the removal of the valve unit without disturbing the pipe lines.

For 3-way and 4-way action, a double solenoid mounted with valve assembly on a common base provides solenoid action by push buttons or automatic contactors for high speed air valve operation. The solenoids are connected by continuous lever. Valve action is accomplished by energizing either of the two solenoids. As with the single solenoid unit described above, the same standard G. E. solenoids are used in the various assemblies.

For 6-way action valve, two 3-way valve units are mounted in one cage. This action provides for the control of two single acting air cylinders independently with one valve, or the 6-way unit may be used for the control of double acting air cylinders to exhaust both ends at once. Valve cages of double solenoid assemblies employ standard "Quick-as-Wink" valve units to supply the various actions desired.

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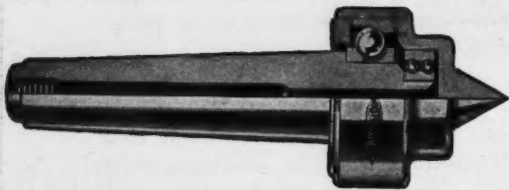
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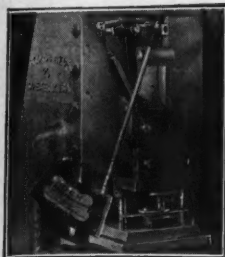
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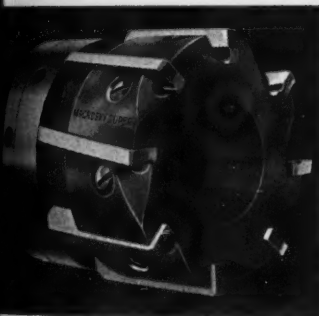


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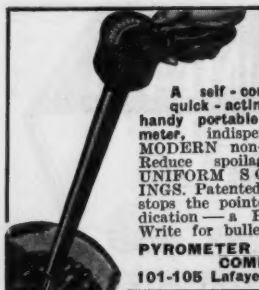
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## McCrosky --- SUPER Adjustable Reamers

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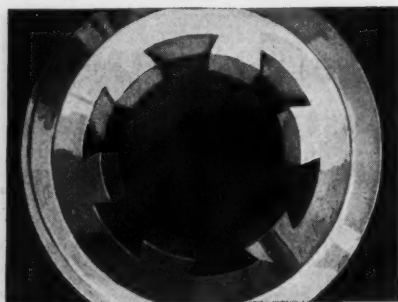
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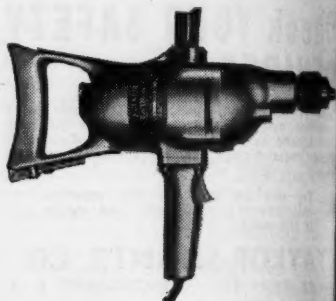
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THE BRISTOL COMPANY, Waterbury, Conn.

**SOCKET HEAD SET AND CAP SCREWS**

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The Black & Decker Mfg. Co., Towson, Md., has announced a 1/2-in. "Junior" Electric Drill as companion to the 1/4-in. Junior drill announced several months ago. The feature of the 1/2-in. Junior drill is its versatility, making it adaptable for a wide variety of drilling and cutting applications. It has proved exceptionally efficient in the operation of hole saws as its low spindle speed and powerful torque are said to be perfectly adapted to the work of cutting clean



## Black & Decker 1/2-In. Junior Electric Drill

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Owing to their light weight, great strength, and pleasing appearance, the demand for textsteel sheaves for V-belt drives has become so great that additional stock sizes have been added to the line of textsteel sheaves made by Allis-Chalmers Manufacturing Company, Milwaukee, Wis. Duo-brace textsteel sheaves can now be furnished up to 15 h.p.

The grooves in the duo-brace textsteel sheave are so designed that the sheave

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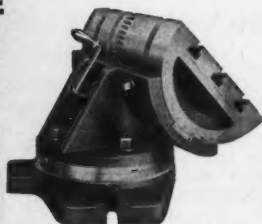
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This accu-  
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It eliminates costly fixtures, decreases pro-  
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1. **INCREASES** production—  
Cuts tool costs.
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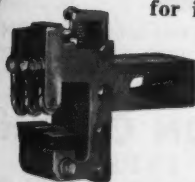
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It tells the "hole" story.

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It will pay you well to  
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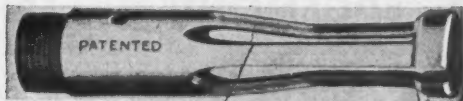
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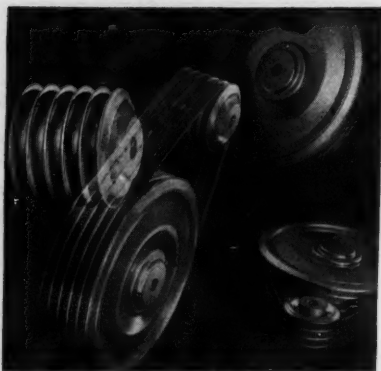
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Allis-Chalmers Duro-Brace Textsteel Sheaves

can be used with A section belts ( $\frac{1}{2}$  x 11/32 in.) or with B section belts (21/32 x 7/16 in.), depending upon the application. The standard line now includes 25 different diameters of sheaves from 3-in. to 18-in. inclusive and for any number of grooves from 2 to 6 inclusive, comprising a line of 125 different duro-brace textsteel sheaves. All sheaves are now available with interchangeable type hubs with bores in increments of

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The illustration shows the "Sta-Kool" Water-Cooled Diamond Holder which has been placed on the market by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y. The Sta-Kool holder is so designed that it directs the stream of cooling water not only onto the point of the diamond, but also onto and through the metal immediately back of the diamond, thus carrying off a large part of the heat that is generated around the major portion of the stone and eliminating the difficulties which arise from the generation of such heat.

The design of the holder is said to insure a cool, long



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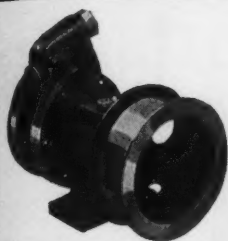


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BALL BEARING  
FRICTION CLUTCH



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### TAPPING ATTACHMENT

This Tapper permits taking full advantage of modern high speed steel ground thread taps.

Tapping costs are sometimes 300% lower. Accuracy is certainly better.

THEY RUN IN OIL. There is a smooth, quiet, skilled sensitiveness to it that pleases the operator.

TRY ONE. Jack up your speed to a couple thousand R.P.M.—it's impressive. They are sent out on trial.

TWO SIZES READY

No. 100— $\frac{1}{8}$ " cap. No. 200— $\frac{1}{4}$ " in steel

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## ETTCO TOOL CO., Inc.

594 JOHNSON AVE.

BROOKLYN, N. Y.

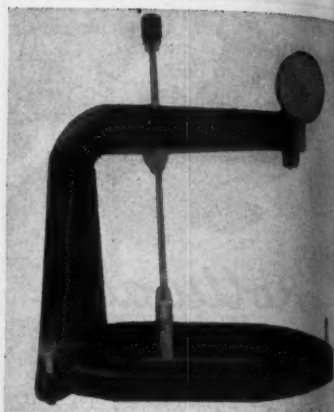
diamond life, insurance against diamond breakage and consequently reduced diamond cost.

### Rockwell Dilatometer

The illustration shows the Model P Dilatometer which has been placed on the market by The Stanley P. Rockwell Company, Hartford, Conn. With this instrument the steel treater can measure the microscopic length changes which occur in steel as it is heated or cooled and thus the best possible results can be obtained from the heat treating. For instance, the Dilatometer will indicate the critical point and thus enable the tool hardener to quench his steel at exactly the proper point to obtain the best results.

The instrument shown is the Dilatometer in its simplest form, consisting of a frame lever and dial with the necessary quartz feeler rod with a simple screw adjustment. It is indicating and non-recording.

The Model P Dilatometer finds its greatest usefulness as an extra control, insurance, and guarantee of correct hardening of tools, dies, and so on. It may be used with a great range of existing oven and pit type tool hardening



Rockwell Model P Dilatometer

furnaces, and will indicate precisely and definitely the beginning and end of steel transformation, to the end the steels of known or unknown composition may be heated to the exact temperature to produce maximum hardness, to



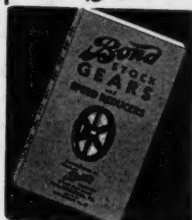
### M-D Facing Heads

**With Automatic Feed**  
Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30".

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### By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

Write us for circular "H", giving us name of your nearest dealer.



**YOST MANUFACTURING COMPANY, MEADVILLE, PA.**



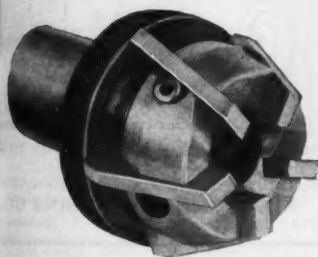
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And since these products are made by specialists and are sold at the right prices, your complete satisfaction is assured.

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HOLLOW BORING CO.**  
2000 Raspberry St.  
Eric, Pennsylvania



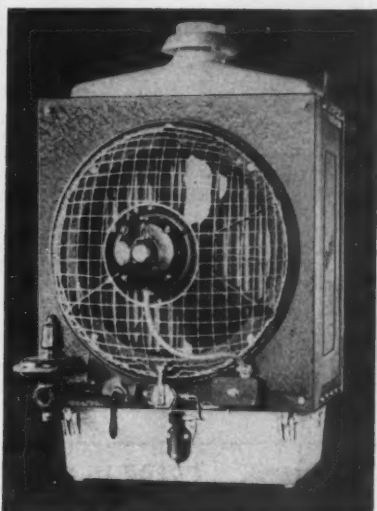
## GENESEE ADJUSTABLE HOLLOW MILLS

*Are Cutting Costs Everywhere*  
**SEVEN DIFFERENT STYLES**

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now. Write for catalogue.

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141 No. Water St., Rochester, N. Y.

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### Quickly and Cheaply Installed

Buffalo Gas Heaters require only connection to gas line, electric current and the application of a match—and they begin to HEAT! They require no fuel storage—or ash heap. They are odorless, dustless and smokeless—and no fireman or engineer is required to operate them.

Used for heating every kind of shop, store, office, garage, storage building, etc. Full approval of Fire Underwriters.

**Also STEAM Units:** Buffalo manufactures a complete line of floor and suspended steam unit heaters also.

**Write for Bulletins:** Before you buy any heating equipment send for Buffalo Bulletin No. 469 which describes the entire line. Complete ratings included.

## BUFFALO FORGE CO.

388 Broadway Buffalo, N. Y.  
In Canada: Canadian Blower & Forge Co.  
Ltd., Kitchener, Ont.

structure, and freedom from strains or other conditions which foster crackling. The weight of the instrument is 37 pounds.

### Sil-Fos Brazing Alloy

The need for a low cost, low melting point, strong, easy flowing brazing alloy has now been met by the development of a brazing alloy containing silver, to be known as "Sil-Fos." The alloy is a product of the laboratories of Handy and Harmon, 82 Fulton St., New York, N. Y.

Sil-Fos promises to introduce new ease and economy into many brazing and welding operations. Unlike base metal brazing or welding alloys, Sil-Fos melts readily at 1300 deg. F. This is a lower temperature than is required for silver solders containing less than 50 per cent silver, which requires from 1400 to 1500 deg. F.

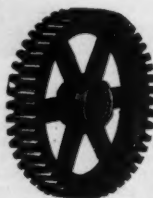
Due to its silver content, Sil-Fos is free flowing. It penetrates quickly, and alloys with adjacent metal, making a strong, sound bond. When used with borax-flux, which requires a heat of about

1400 deg. momentarily, Sil-Fos becomes even more fluid because of the heat. These qualities lead to economies since only a small quantity of the alloy is required.

The manufacturer claims that only a small amount of Sil-Fos is needed for tight-fitting joints, and no flux is necessary. Because of its low melting point and its quick-flowing and penetrating qualities, it is easy to use and insures a high percentage of good joints. Labor is saved, also, in cleaning and finishing completed joints. There is little or no flux to remove and a little of the Sil-Fos will remain on the outside of the work.

### Federal "Clear Vision" Dial Comparator

Realizing that modern mechanical requirements are calling for increasing finer tolerances, the Federal Precision Corporation, Providence, Rhode Island, has designed and placed on the market the Model 110 "Clear Vision" Dial Comparator shown in the illustration.



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**on Milling Cutters, Drills and Reamers.**

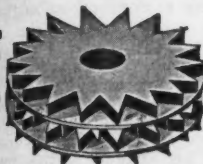
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Detroit, Michigan

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Powerful torch used separately as a very handy  
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nace, no scaling or decarburization, reaches high  
speed heat in 40 minutes at 7c per hour; quickly  
saves its cost. Muffle 7"x3 1/2"x2 1/2". \$35.  
Also a large furnace with built-in torch, muffle  
7"x4 1/2"x3 1/2".

## STARK TOOL CO.

Originators of the American Bench Lathe  
Est. 1862 WALTHAM, MASS.

## Grinds

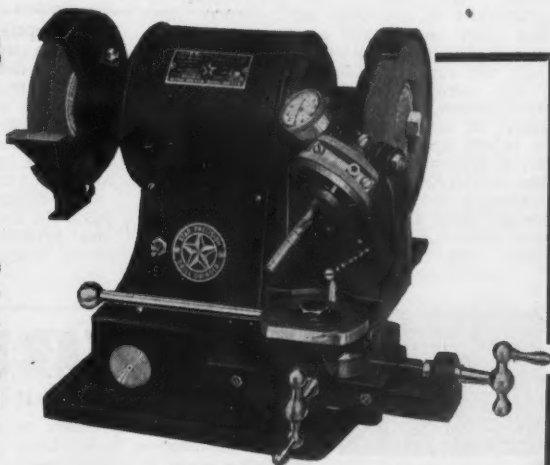
81 SIZES OF

## Drills

No. 31 to 1/2"

NEW!

This new Star Precision  
Grinder puts drill grind-  
ing on a production basis.  
Its simplicity and accu-  
racy saves as high as  
50% on drill costs and  
insures uniform accuracy  
that guarantees perfect  
holes.



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## STAR MACHINE & ENGINEERING CORP.

Division of Star Electric Motor Co.

BLOOMFIELD AVE.

BLOOMFIELD,

NEW JERSEY

instrument makes it possible to measure a half of 1/10,000 of an inch very clearly. The indicator used in this comparator is a Federal Model 95 "Clear Vision" Indi-



Federal Model 110 "Clear Vision"  
Dial Comparator

cator. The dial of the instrument is graduated to one-half of 1/10,000 inch and each one of the graduations measures 0.1175 inch between lines or 0.1235 inch for each 1/10,000 inch graduation.

The comparator, itself, is extremely rigid, as would be necessary in an instrument of this character. The indicator is raised and lowered by means of the knob shown on the right hand side of the instrument in the illustration. The indicator is clamped in position by means of a knob on the left hand side, and with a minimum of change in position. The lower anvil is raised and

lowered by means of a large diameter ring which bears upon ball bearings. The thread, itself, is a 24-pitch thread which gives a micrometer adjustment to the anvil.

Although the anvil illustrated standard, other special types can be furnished by the company at an extra charge. Because of the accuracy of the instrument and the construction of the anvil device, the company insists upon installing all special anvils itself.

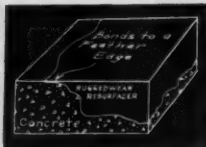
The complete instrument, because of its compact and streamlined design, extremely accurate and practical for determining extremely fine sizes.

### Bausch & Lomb Optical Protractor

Bausch & Lomb Optical Co., Rochester, N. Y., has developed an optical protractor with which angles to one minute of arc can be measured rapidly and accurately, directly off the scale, thereby eliminating all mathematical calculations or reference tables. Unskilled operators can use this instrument, making settings to a degree of accuracy comparable to those secured with a sine bar in the hands of a skilled operator but with much greater speed and no chance of errors in calculation.

The optical protractor is used for setting up work on jig boring machines, milling, drilling, grinding, planing, shaping machines, or for work on the bench or surface plate and for layout or inspection of jigs and fixtures. It is also used for determining taper, dovetails, grooves, and all sloping angular surfaces.

The instrument is built upon an adjustable base, and the ring center of the protractor revolves, carrying with it a level vial and protractor scale.



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**Attachment for drill presses**

New tapping attachment taps holes perfectly at tremendous speeds. Has friction drive and reverse with double-cone, cork-faced, balanced heat treated bearings; and three point gear reversing mechanism. Economical to maintain. Compact, changeable. Precision-made with all parts interchangeable. Three sizes. Many other styles for

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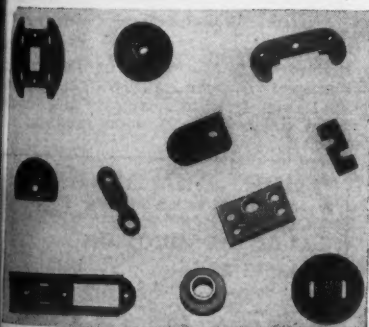
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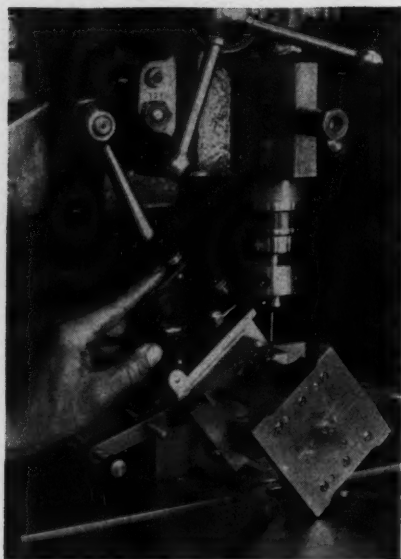
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No matter what your particular need may be for fibre parts, with our long experience and complete equipment, we can, no doubt, save you time, trouble and money. Why not let us study your requirements and possibly help you cut your production costs. Our catalog will

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Bausch &amp; Lomb Optical Protractor

equipped with a vernier which permits reading to one minute of arc. The adjustable base makes it possible to correct the protractor for any inaccuracy from the true level in the bed of the machine. After truing the base the center ring is merely revolved by hand, or by micrometer screw acting as a fine adjustment, until the required angle appears on the scale.

### "Yoloy" Nickel Copper Alloy Steel

A new alloy steel, to be known as "Yoloy", has been announced by the Youngstown Sheet & Tube Company,

Youngstown, Ohio. The new product is of nickel copper alloy steel having exceptional resistance to corrosion and having the feature of high tensile strength combined with high ductility, workability and weldability. Yoloy steel is produced in sheets, strips, plates, bars, shapes, wire and seamless pipe.

### Williams "Non-Sparking" Safety Wrench

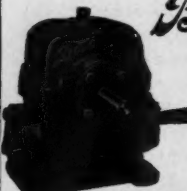
A "Non-Sparking" Safety Wrench especially intended for use where fire hazards exist has been added to the line of J. H. Williams & Co., 77 Spring Street, New York, N. Y. The wrenches are forged from Beryllium-Copper and accurately heat treated. They are claimed to be of superior strength, toughness and hardness. Tests have proved them to be practically as strong as steel wrenches of similar design and size. The material from which the safety wrench is made is non-corroding and non-rusting. It is finished in green enamel and the heads are polished.



Williams "Non-Sparking" Safety Wrench

bright with the sizes of the opening stamped in clear figures. The wrench is available in both single and double head patterns in a wide range of sizes.

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Bronze Worm Gears.  
Hardened Worms.  
Timken Bearings. Oil  
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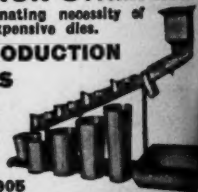
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## "Rust-Oleum" Rust Preventative Paint

A special processed paint, formed of a combination of oils and pigments that are especially treated and blended to form a rust preventative and preservative for metals, is now being marketed by Rust-Oleum Corporation, 1822 W. Grand St., Chicago, Ill. The composition of the paint is such that any rust that may be present at the time of application is removed with the paint, and as the paint dries it forms a firm but flexible surface which contracts and expands with temperature variations.

Users of Rust-Oleum state that it will not crack, peel, or blister, yet will withstand a temperature of 550 deg. F. It will also withstand extreme cold, gases, sulphuric and other fumes, and all other corrosive agents when used as directed. Rust-Oleum may be brushed, sprayed, or dipped. A gallon will cover 600 to 800 square feet of surface, and is easily applied. It can be applied over other paints, and leaves no brush marks. Sand-blasting is not necessary, due to the action of the rust with the paint. It is said to dry in six to eight hours.

Rust-Oleum is available in a variety of colors, including machine tool gray.

## Columbia TOOL STEEL

It takes modern tool steel to cut efficiently in modern machines.

*It pays to use Good Tool Steel.*

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## Did You Know That---

Internal band-sawing is now practical and simple? See page 13.

You can tap 2,000 holes an hour with proper equipment? See page 64.

A practical light wave micrometer for shop and laboratory use is now available? See page 114.

All hand operations or movements can be classified in 18 basic divisions? See page 42.

A straight open-and-shut solenoid-controlled valve is now available? See page 43.

Stainless steel can easily be machined by the use of a very simple cutting fluid? See page 62.

Disc wheels are now being made by mounting grinding wheels on  $\frac{1}{8}$ -in. thick steel backs? See page 21.

A milling machine is now available with a table that can be tilted end-

ways for milling on angles or tapers? See page 8.

Production could be increased substantially in many cases by providing an adequate lighting system? See page 37.

A properly-conducted apprenticeship system is not only a valuable asset to the employer and to the young men who receive the training, but also to the community? See page 32.

An instrument has been developed with which surface irregularities—the peaks and valleys in an apparently smooth surface—can be measured to within one-millionth (0.000001) inch? See page 1.

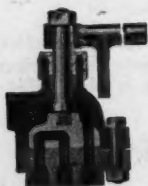
A paint is now being made with which any rust present will fuse, which will withstand acid fumes and temperatures of 550 deg., and which will prevent rust and deterioration? See page 155.

**MORSE SILENT CHAIN DRIVE SELECTOR.** The correct size sprockets for a silent chain drive can easily be determined by the use of a Silent Chain Drive Selector which is being distributed by Morse Chain Co., Ithaca, N. Y. The use of the Selector makes it a simple matter for any person, engineer or not, to properly select a chain driven within the range of  $\frac{1}{2}$  to 150 h.p., which includes about 95 per cent of all actual installations. It enables him immediately to select the number of teeth in the sprockets, pitch and width of the chain, gives the standard center distances, figures the chain length, gives

the diameters of the sprockets, and indicates the sizes that are carried stock by the Morse Chain Co.

Manipulation of the Selector is simple and the various figures are obtained almost instantly. The Selector should be of great help to machine designers who use chain drives on equipment and it should also be of assistance to the customer who uses occasional chain drive in his plant.

A Morse Silent Chain Drive Selector will be sent to any mechanical engineer or manufacturing executive upon request.



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For use on air, water, steam or oil for operating single and double acting cylinders, on pressures up to 300 lbs. Made in Lever, Foot and Solenoid Operated types.

*Bulletins on request.*

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for Standard Commercial and Tungsten Carbide Tipped Bits. A rigid cutting-off holder.

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